Competition Policy and the Incentive to Innovate: The Dynamic Effects of *Microsoft v. Commission*

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Microsoft v. Commission *indicates a shift in competition policy at the expense of protections for intellectual property. The case applies "essential facilities" arguments to Microsoft's server operating system and "tying" arguments to its Windows Media Player. The dynamic effects of* Microsoft v. Commission *pose a substantial risk to the incentive to innovate in several ways. First, mandatory licensing and unbundling of the elements of an invention erode intellectual property rights. Second, the targeting of multinational corporations by the European Union creates barriers to international trade whose impacts extend across the global economy. Third, the interpretation of "abuse of a dominant position" focuses on market outcomes rather than on anticompetitive conduct, thus penalizing successful innovators and rewarding their competitors. Competition policy based on* Microsoft v. Commission *diminishes the incentive to innovate.*

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Introduction

Microsoft v. Commission[1] heralds an activist European competition policy that threatens incentives to innovate around the world. The European Court of First Instance's (Court) decision to uphold the findings of the Commission of the European Communities (Commission) combines actions in both business and consumer markets. On the business side, the Commission charged that Microsoft's server operating system had an unfair advantage over other server operating systems, effectively requiring Microsoft to unbundle individual elements of the software program and make them available to competitors. The decision treats individual elements of a software program as "essential

1 Case T-201/04, Microsoft v. Comm'n, 2007 E.C.R. II-1 (2007); *see also Commission Decision of 24.03.2004, Relating to a Proceeding Under Article 82 of the EC Treaty (Case COMP/C-3/37.792 Microsoft)*, COM (2004) 900 final (Apr. 21, 2004), *available at* http://ec.europa.eu/comm/competition/antitrust/cases/decisions/37792/en.pdf [hereinafter *Commission Decision*].

facilities." On the consumer side, the Commission's decision addressed the market for software applications through its charge that Microsoft abused its dominant position by "tying" Media Player with Windows. The decision extends unbundling and compulsory access from product bundles to the elements of individual products.

Microsoft v. Commission will adversely impact incentives to innovate in three main ways. First, *Microsoft v. Commission* is an attack on intellectual property (IP) rights that reduces firms' incentives to innovate. Successful firms risk having their inventions disclosed to competitors and unsuccessful firms expect to obtain inventions from successful firms by threatening to file antitrust complaints. The decision significantly weakens protections for IP. By sanctioning Microsoft for not disclosing fundamental innovations to its server software to its rivals, the Court will reduce incentives to invest in costly research and development (R&D). The returns to R&D for most firms would be reduced or eliminated if they were required to disclose the results to their competitors, allowing competitors to either adopt or copy the inventions. The Court's decision also deters innovation by competitors of leading firms. Why invest in costly R&D, when you can get it for free from the leading company in your industry? Simply send the leading company a request for the use of any and all of its innovations, and threaten to complain to the antitrust authorities if there is not full compliance. Since a leading company's failure to supply the innovation is ruled to be an "abuse," companies with smaller market shares will know where to obtain free innovations. The Commission argued that competition policy trumps protections for IP. By eroding the foundations of IP, incentives to innovation in any industry will suffer, not just in computer software. The interoperability side of the case establishes a major precedent that will impact IP protections throughout the EU in many industries.

Second, *Microsoft v. Commission* raises barriers to international trade by attacking entry of foreign firms into the European marketplace, thus further reducing incentives to innovate. The European Union represents almost one third of total world Gross Domestic Product (GDP). The fines, legal costs, and regulatory sanctions associated with *Microsoft v. Commission* have the impact of non-tariff barriers to trade. The European Commission is itself an instrument of trade policy for the European Union. The use of competition policy to restrict trade avoids the scrutiny of the World Trade Organization that might accompany explicit trade restrictions. Competition policy that restricts access of foreign competitors to European markets functions as a form of industrial policy that protects and subsidizes European companies. The forced disclosure and compulsory access to intellectual property of foreign firms further serves as a form of industrial policy and subsidization of European companies.

Third, *Microsoft v. Commission* penalizes market outcomes rather than anticompetitive behavior, thus reducing incentives to innovate competitively. The decision is based on an allegation that Microsoft abused a dominant market position. The actions in question are not those that created the dominant market

position, hence they are not alleged to represent monopolization or exclusion in themselves. The actions also are not deemed to be abuse for firms that are not in a dominant market position. The charge of abuse of a dominant position thus penalizes a successful firm for market outcomes rather than anticompetitive behavior. The Court's decision reduces the returns to innovation because firms that achieve market leadership through successful innovations are penalized for achieving a dominant position. Competitive actions that would be viewed as benign for firms that are not market leaders are interpreted as abusive. By penalizing Microsoft for bundling its Media Player with Windows, the Court will make companies reluctant to add innovative features to their products.

The Commission's wide-ranging actions herald Europe's competition policy towards innovation. These actions have implications far beyond information technology (IT). The use of competition policy as a targeted instrument of trade policy is evidenced by cases such as those against Visa,[2] MasterCard,[3] Intel,[4] Qualcomm,[5] Rambus[6] and Google.[7] The Commission's "Statement of Objections" (SO) states the preliminary view that "Intel has infringed the EC Treaty rules on abuse of a dominant position (Article 82) with the aim of excluding its main rival, AMD, from the x86 Computer Processing Units (CPU) market."[8] The Commission was clearly aware of the long-term consequences of its competition policy. Commissioner Kroes observed that "The repercussions of these changes will start now and will continue for years to come."[9]

The precedent set by *Microsoft v. Commission* became apparent when the Commission subsequently opened an "antitrust campaign" against Microsoft's

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2 Press Release, European Comm'n, Antitrust: Comm'n Fines Visa €10.2 Million for Refusing to Admit Morgan Stanley as a Member (Mar. 10, 2007), http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1436.

3 Press Release, European Comm'n, Antitrust: Comm'n Prohibits MasterCard's Intra-EEA Multilateral Interchange Fees (Dec. 19, 2007), http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1959.

4 Press Release, European Comm'n, Competition: Comm'n Confirms Sending of Statement of Objections to Intel (July 27, 2007), http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/07/314.

5 Press Release, European Comm'n, Antitrust: Comm'n Initiates Formal Proceedings Against Qualcomm (Oct. 1, 2007), http://europa.eu/rapid/pressReleasesAction.do? reference=MEMO/07/389.

6 Press Release, European Comm'n, Antitrust: Comm'n Confirms Sending a Statement of Objections to Rambus (Aug. 23, 2007), http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/07/330.

7 Press Release, European Comm'n, Mergers: Commission Opens In-depth Investigation into Google's Proposed Take Over of Double-Click (Nov. 13, 2007), http://europa.eu/rapid/pressReleasesAction.do?reference= IP/07/1688.

8 Press Release, European Comm'n, *supra* note 4 ("First, Intel has provided substantial rebates to various Original Equipment Manufacturers (OEMs) conditional on them obtaining all or the great majority of their CPU requirements from Intel. Secondly, in a number of instances, Intel made payments in order to induce an OEM to either delay or cancel the launch of a product line incorporating an AMD-based CPU. Thirdly, in the context of bids against AMD-based products for strategic customers in the server segment of the market, Intel has offered CPUs on average below cost.").

9 David Lawsky, *Microsoft Finally Bows to EU Antitrust Measures*, REUTERS, Oct. 22, 2007, http://uk.reuters.com/article/UKNews1/idUKKIM25281920071022.

core technology strategy. The new investigation targeted applications software that form Microsoft's Office Suite, including software for word-processing (Word), spreadsheets (Excel), presentations (PowerPoint), publishing (Publisher), and communications (Outlook). An additional investigation would consider the alleged "tying" of the Internet Explorer browser to Windows, the ".Net" Internet-based applications that run on Windows, and the connections between the Outlook and Exchange e-mail programs.[10] The investigation was triggered when Opera Software of Norway filed a complaint against Microsoft with the European Commission, although the Commission was already well prepared. It accused Microsoft of abuse of its dominant position in operating systems for personal computers by bundling its web browser Internet Explorer with Windows. Opera also alleged that Microsoft reduced interoperability by not using open Web standards.[11] The Commission proceeded despite the fact that the secondary market, Internet web browsers, was highly competitive. Mozilla's Firefox was freely available and was the leading alternative to Internet Explorer. Safari was the default browser on Apple's Mac but could also run on Windows computers. Netscape was still available albeit with a small market share. Opera had a negligible market share of desktops but a larger presence on cell phones.[12]

This Article is organized as follows. Section I reviews the particulars of *Microsoft v. Commission*. Sections II examines the implications of the case for IP protection and the resulting implications for the incentive to innovate. Section III considers how the case affects firms' competitive strategies and the relationship between competitive strategy and the incentive to innovate. Section IV examines the effects of the case on barriers to international trade and the consequences for incentives to innovate.

I. How *Microsoft v. Commission* Affects IP Rights

The Court upheld the Commission's charge that Microsoft had infringed Article 82 of the European Community (EC) Treaty by its "abuse of a dominant position."[13] The case involved two types of software, the Windows

10 Richard Waters, *EU Launches New Microsoft Antitrust Probe*, FIN. TIMES ONLINE, Jan. 14, 2008, http://us.ft.com/ftgateway/superpage.ft?news_id=fto011420081217021991; Jennifer L. Schenker, *EU-Microsoft II: The Rematch*, BUS. WK. ONLINE, Jan. 15, 2008, http://www.businessweek.com/technology/content/jan2008/tc20080114_194423.htm.

11 Tom Espiner, *Microsoft Strikes Back at Opera Antitrust Claims*, CNET NETWORKS, Dec. 14, 2007, http://www.news.com/Microsoft-strikes-back-at-Opera-antitrust-claims/2100-1016_3-6222809.html.

12 David Sharmah, *Digital World: Night at the Opera*, JERUSALEM POST, Jan. 1, 2008, at 18.

13 Case T-201/04, *Microsoft v. Comm'n (Microsoft)*, 2007 E.C.R. II-1, II-9; *see also* Treaty Establishing the European Community, Nov. 10, 1997, 1997 O.J. (C 340) 3 [hereinafter EC Treaty], art. 82 (concerning pricing, exclusion, price discrimination, and tying). The Commission also relied on Agreement on European Economic Area, May 2, 1992, 1994 O.J. (L 1) 3 [hereinafter EEA], art. 54. Both articles are very similar with the main difference that instead of the common market, EEA art. 54 refers to "the territory covered by this Agreement or in a substantial part of it shall be prohibited as

Server operating system and Windows Media Player. The Commission alleged that Microsoft had a dominant position in both client PC operating systems and work group server operating systems. The Court found that Microsoft had abused its dominant position by not supplying interoperability information to its competitors for its Windows Server operating system. The Court also found that Microsoft had abused its dominant position by bundling its Media Player with its Windows PC operating system.

This Section examines the main developments in the case. The main issues pertaining to the Windows Server operating system were disclosure of IP based on the need for interoperability, unbundling and access to IP, and the antitrust treatment of IP based on essential facilities doctrine. The main issues with regards to Windows Media Player were the Commission's network effects theory, its definition of the product market, and the alleged tying of the terms of contracts with personal computer makers.

A. *Windows Server Operating System*

1. Disclosure of IP and Interoperability

Microsoft v. Commission grew out of a complaint by Sun Microsystems (Sun) before the European Commission. Sun alleged that Microsoft had withheld information about its server computer operating systems that Sun needed for its Solaris-based servers to interoperate fully with Microsoft's PC operating systems.[14] Sun, a maker of network-computing hardware and software, requested access to Microsoft's IP in September of 1998. The request included source code for Windows Server 2000, a software product that was still under development at that time. Additionally, Sun requested a substantial amount of secret information including detailed technical descriptions of Windows server operating systems.[15] From Microsoft's perspective, the IP requested by Sun precisely targeted its innovations.[16]

Upon Sun's allegations, the Commission initiated a series of actions and investigations based on Article 82, particularly concerning "limiting production, markets or technical development to the prejudice of consumers."

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incompatible with the functioning of this Agreement in so far as it may affect trade between Contracting Parties."

14 *Commission Decision*, *supra* note 1, at 5.

15 *See* Ian S. Forrester, Address at the International Bar Association 11th Annual Competition Conference in Fiesole, Italy: Unilateral Conduct in Global High-Tech Industries: The Implications for the Future of the Microsoft Case, the Server Technology Issues (Sept. 7-8, 2007) (stating that Sun's request also was remarkable for what it did not contain. The request did not specify communications protocols, which would lie at the heart of the Commission's case. Furthermore, Sun's request did not explicitly seek to license Microsoft's technology. Microsoft's reply also was significant in what it did not contain. Microsoft requested a meeting with Sun without any explicit refusal to deal and without an assertion of IP rights).

16 *Id.*

[17] Effectively, Microsoft was alleged to have excluded Sun from the market for servers by refusing to provide its technology to Sun.

The Commission found Microsoft held a dominant position in PC operating systems, even though the issue at hand concerned server operating systems. The Commission applied several criteria: Windows had a large market share, Windows set an operating system standard, and Windows's "indirect network effects" created barriers to entry.[18] In addition, the Commission found that Microsoft held a dominant position in server operating systems because of its high market share relative to Novell Netware, Linux, and other Unix vendors, because of entry barriers due to network effects, and because of links with the PC market.[19]

The Court's definition of work group server operating systems refers to "operating systems designed and marketed to deliver collectively 'basic infrastructure services' to relatively small numbers of client PCs connected to small or medium-sized networks."[20] The relevant feature of Microsoft's Windows 2000 Server operating system is Active Directory. This feature coordinates services, such as file sharing and e-mail, networked resources, such as shared printers, and administration of users. In practice, Active Directory is employed by companies and other organizations that manage networks of all sizes, with some reaching millions of services, resources and users.

Windows 2000 technology with its Active Directory feature offered some improvements relative to the earlier Windows NT server operating system. As the Commission noted, a useful feature was that it allowed administrators "centrally to manage collections of users, computers, applications and other network resources instead of managing [those] objects on a one-by-one basis."[21] Windows 2000 further allowed the management of files on both client PCs and work group servers, using the "Distributed File System."[22] The Commission found that the architecture of the Windows work group server networks facilitated interactions between servers and between servers and PC clients. Such interactions allowed "'transparent access' to the main services provided by work group servers."[23]

The protocols that are essential to interoperability include both server/server interaction and client/server interaction. The Commission's main argument here rests on the assertion that interaction between servers was closely connected to the interaction between servers and PC clients. The Court

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17 *Commission Decision*, *supra* note 1, at 5.

18 Case T-201/04, Microsoft v. Comm'n, 2007 E.C.R. II-1, II-8 (2007) (citing the Commission's finding that Microsoft had over ninety percent of PC operating system software).

19 *Id.* (citing the Commission's finding that Microsoft had over sixty percent market share of work group server operating system software). This definition did not include all other types of servers including systems for larger networks.

20 *Id.* at II-33.

21 *Id.* at II-35.

22 *Id.*

23 *Id.* at II-38.

agreed with the Commission that "the common ability to be part of [the Windows domain architecture] is a feature of compatibility between Windows client PCs and Windows work group servers."[24] Active Directory, which lies within the Windows server operating system, was targeted as an essential facility.

Yet, the critical part of interoperability that concerns providers of either server software or PC software is whether these work together when provided by different software firms. This is sometimes referred to as "multivendor interoperability."[25] Microsoft provided "multivendor interoperability" and additional features that allowed its own servers to work together in innovative ways. This feature had value to its customers and represented an innovation in comparison with other companies' server software.

In the name of interoperability, the Court and the Commission extended the usual server/client interoperability to the new server/server interoperability. By obtaining the technology, a competitor of Microsoft, such as Sun, would be able to achieve similar interoperability between its own servers. This outcome would not contribute to interoperability in the usual sense of the term. Instead, the result would be to transfer a firm's innovation to its competitors.

The Commission's definition of abuse of a dominant position was that Microsoft should have disclosed "specifications" and not their "implementation." The Commission defined "specifications" as a "description" of the functions of the software protocols in contrast to "implementation" which it defines as the "source code." The Court found that what was needed from Microsoft was a "detailed technical description of certain rules of interconnection and interaction that can be used within the Windows work group networks to deliver work group services."[26]

The Court, the Commission and Microsoft seemed to agree that "interoperability was a matter of degree."[27] The question was whether or not disclosure was also a matter of degree. By disclosing so-called specifications to a competitor, the result would be that competitors could learn the necessary technology for coordination between servers. Even without the disclosure of specific source code, the effect would be the same. Rather than multivendor interoperability, the result would be that competing vendors would obtain the technological innovation that would improve the functioning of their servers.

Moreover, competitors would be able to make their servers interchangeable with those of Microsoft. A customer would then be indifferent between buying a group of Windows-based servers, a group of Sun's Solaris servers, and more significantly, a mixture of the two. The interoperability in question refers to that *within* a software program rather than *between* software

24 *Id.* at II-39.
25 *Id.* at II-43.
26 *Id.* at II-42.
27 *Id.* at II-32.

programs. This stretches the conventional notion of interoperability beyond the breaking point.

A software program is composed of multiple elements that together deliver the software's various functionalities. For the software to function, its elements must work together harmoniously. This is a type of interoperability that occurs within a software program. This type of interoperability is different from the exchange of information between different software programs. It refers to the exchange of information within a software program. As Microsoft argued, to license communications protocols necessarily meant disclosing intellectual property since these could not be separated from the internal workings of its operating system software.

Microsoft argued that "full interoperability is available to a developer of server operating systems when all of the functionality of his program can be accessed from a Windows client operating system."[28] Existing protocols already provided for full multivendor interoperability. Instead, Microsoft maintained that the Commission required Microsoft to provide sufficient technology that its competitors' servers would perform as clones of those with Microsoft Windows operating systems. This extends the notion of interoperability to the additional requirement that competing servers offer the same functionalities.

In contrast, the Commission argued that "client/server and server/server interoperability are closely interlinked and, in order that full interoperability can be achieved between a Windows client PC and a non-Microsoft server operating system, Microsoft must give access both to the client/server communication protocols and to the server/server communication protocols."[29] The Commission maintained that Microsoft's competitors would use Microsoft's interoperability technology to develop, not clones, but "improved products, with 'added value.'"[30]

The Court agreed that "by nature, interoperability implies a 'two-way' relationship in that it states that 'the function of a computer program is to communicate and work together with other components of a computer system.'"[31] The Court's argument is misleading. Citing a general definition of interoperability does not provide support for the notion that all parts of a computer system must work together even if offered by different firms. This approach extends the definition of interoperability between systems to interoperability within computer systems.

The Court further argued that Microsoft's dominant market position trumps the relevant definition of interoperability. For the Court, the key question is whether competitors need the technology. Competitors, in the view

28 *Id.* at II-43.
29 *Id.* at II-44.
30 *Id.* at II-45.
31 *Id.*

of the Court, must be able to deliver all of the functionalities that Microsoft delivers. By sweeping aside interoperability, the Court simply meant that competitors must be able to offer products with the same quality as those of Microsoft—but that they cannot do so without access to Microsoft's technology. The Court's argument suggests that competitors' servers cannot interoperate with each other in a manner consistent with Microsoft's server software. This addresses a critical feature of Microsoft's product quality innovation. Providing technological information about this feature may improve the performance of competitor software, but this differs from the standard interpretation of interoperability.

The Court's argument reduces to the following: Competitors' work group servers must be

> capable of receiving a specific message from a Windows client PC or work group server operating system and giving the required response to that message on the same conditions as a Windows work group server operating system and also of enabling Windows client PC or work group server operating systems to react to that response just as though it came from a Windows work group server operating system.[32]

The Court pointed out that the competitors' operating systems need not function internally in a manner identically to that of Microsoft and that competing operating systems may offer improvements in "security, reliability, processing speed or the innovative nature of certain functionalities."[33] These protestations aside, the Court required disclosure of technology that competitors can use selectively to improve their products.

2. Unbundling and Access to IP

The disclosure requirements of the Court have the effect of unbundling the elements of a specific software program. With selective disclosure of individual elements of software, a competitor can assemble a similar software program by combining elements of an incumbent firm's software with some of its own elements. A competitor need not invest in designing all the elements of a software program. Rather, it can design some elements and obtain the missing elements from an incumbent firm. The result will be a software program that has the look, feel, and performance of the incumbent firm's software.

The Court's view of interoperability in software is analogous to unbundling of telecommunications in the U.S. Telecommunications Act of 1996.[34] Under the Act, a competitor could request access to particular lines,

32 *Id.* at II-47.

33 *Id.* at II-48.

34 Telecommunications Act of 1996, Pub. L. No. 104-104, §101, 110 Stat. 56, 61 (1996).

switches and other elements of an incumbent firm's telecommunications system. This is referred to as "unbundled access." The competitor could then add its own elements and construct a complete network composed of some elements from the incumbent and some of its own. The idea was to reduce the costs of a competitive entrant below that required to establish an entire new network. The unbundling notion extended the antitrust concept of "essential facilities." Regulators in countries that mandated unbundling in telecommunications failed to achieve their goals. In a five-country study, Hausman and Sidak found that mandated unbundling did not achieve such regulatory objectives as lower prices, increased competition in retail and wholesale markets, more facilities-based investment,, and greater innovation.[35]

This approach to disclosure represents a radical extension of the regulatory idea of unbundling in the U.S. Department of Justice case against Microsoft. The Commission was influenced by the outcome and substance of the U.S. case.[36] The Commission's decision in 2004 followed the U.S. district court's judgment adopting a consent agreement between Microsoft and the U.S. government and various states by a little over one year.[37] In the U.S. case, the issue was unbundling an application, Internet Explorer, from the Windows PC operating system. In the European case, unbundling extends beyond separating applications from an operating system. It even goes beyond separating functionalities within the operating system itself. Rather, unbundling reaches all the way to individual elements within the Windows Server operating system software.

A particularly troublesome issue was whether IP could be unbundled into components that were themselves essential facilities. From Microsoft's perspective, Active Directory was an innovative technology worthy of IP protections, and not merely a means of interoperability. Developing the technology had required costly R&D investment and the company viewed the technology as having commercial value. Microsoft already had received patent protections for Active Directory. The specifications of the protocols were protected by copyright. Finally, the protocols were trade secrets with commercial value.[38]

3. Application of Essential Facilities Doctrine to IP

The Commission applied an essential facilities approach to intellectual property. In their view, for competitors to achieve the same functionalities as an incumbent firm's software they must have access to its IP. This extended the

35 Jerry A. Hausman & J. Gregory Sidak, *Did Mandatory Unbundling Achieve Its Purpose? Empirical Evidence from Five Countries*, 1 J. OF COMPETITION L. & ECON. 173 (2005).

36 U.S. v. Microsoft Corp. 253 F.3d 34 (D.C. Cir. 2001).

37 *See* U.S. v. Microsoft 231 F.Supp.2d 144, 150 (D.D.C. 2002).

38 *Microsoft*, 2007 E.C.R. at II-53-54.

reach of the essential facilities doctrine.[39] It alleged that Microsoft abused a dominant position in server software by not disclosing technological information. The Commission charged Microsoft with not providing interoperability information, defined as the

> complete and accurate specifications for all the protocols [implemented] in Windows work group server operating systems and . . . used by Windows work group servers to deliver file and print services and group and user administrative services, including the Windows domain controller services, Active Directory services and "group Policy" services to Windows work group networks.[40]

The Court observed that "the Commission emphasizes that the refusal in question does not relate to Microsoft's 'source code,' but only to specifications of the protocols concerned, that is to say, to a detailed description of what the software in question must achieve, in contrast to the implementations, consisting in the implementation of the code on the computer."[41]

Prior EU cases *Magill*[42] and *IMS Health*[43] treat the licensing of intellectual property as "essential facilities." Refusal to grant a license is abusive if the product or service is "indispensable" for a particular line of business, if such refusal excludes all competitors, if the refusal prevents competitors from supplying new products demanded by consumers, and if the refusal is not justified in some way. These cases apply arguments that are analogous to more standard cases in which essential facilities are physical infrastructure. For example, in *Bronner*, a newspaper publisher Oscar Bronner desired access to the distribution facilities of Mediaprint.[44]

Microsoft and the Commission disagreed on whether IP met the test for a facility to be essential. The Court found that competition policy trumps IP rights if the IP is "indispensable" to an activity in the secondary market, which is another way of saying it is "essential."[45] The refusal to license IP creates a problem if it is likely to "eliminate all competition" in the secondary market.[46] Finally, the refusal to license IP creates a competitive problem if it hinders the

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39 *See* Daniel F. Spulber & Christopher S. Yoo, *Mandating Access to Telecom and the Internet: The Hidden Side of Trinko*, 107 COLUM. L. REV. 1822 (2007) (illustrating the U.S. Supreme Court's limitations on the application of essential facilities arguments); *see also* Schor v. Abbott Labs., 457 F.3d 608, 610 (7th Cir. 2006) (stating that "antitrust law does not require monopolists to cooperate with rivals by selling them products that would help the rivals to compete. . . . Cooperation is a *problem* in antitrust, not one of its obligations," and refusing to license IP not violating the Sherman Act, even if it affects a secondary market) (citing Verizon Commc'ns, Inc. v. Law Offices of Curtis v. Trinko, LLP, 540 U.S. 398 (2004)).

40 *Microsoft*, 2007 E.C.R. at II-9-10.

41 *Id.* at II-10.

42 Joined Cases C-241/91 P & C-242/91 P, RTE v. Comm'n (*Magill*), 1995 E.C.R. I-743.

43 Case C-418/01, IMS Health v. NDC Health, 2004 E.C.R. I-5039.

44 Case C-7/9, Bronner v. Mediaprint, 1998 E.C.R. I-7791.

45 *Microsoft*, 2007 E.C.R. at II-64.

46 *Id.*

creation of new products. These three conditions are highly speculative and allow significant latitude for interpretation.

The Commission argued that these considerations were moot because remedying the abuse of a dominant position would make it necessary to infringe on Microsoft's property rights. Nor would IP rights justify withholding technology from competitors. Since failure to provide the necessary information to competitors was an abuse of a dominant position, the Commission was indifferent to whether or not that information was the company's intellectual property.[47] The Court noted in its decision that interoperability in the software industry was "a matter to which the Community legislature attaches particular importance."[48]

By broadening the conditions under which IP can be classified as essential facilities, the Court's decision erodes IP rights. Competing firms have equal access to ideas and scientific talent. This suggests that competitors have the capability to generate similar inventions, which would contradict the assertion that IP constituted essential facilities. A consistent application of the essential facilities doctrine would require a demonstration that the investment required to create such innovations was too costly for potential competitors, although such a showing was not made in this case.

The Court weighed the question of whether a refusal to supply IP constituted an abuse of a dominant position. The main issue was whether exceptional circumstances existed as in *Magill* and *IMS Health*. An abuse existed if the IP was "indispensable" for competitors, in other words, the Court applied the concept of "essential facilities." The Court based its decision on Microsoft's high market share in PC operating systems, not server operating systems. The Court emphasized the need for interoperability between servers and clients, not between servers.[49] The Court argued that customers would adopt the Windows server operating system to work with Windows PC clients, even if the customer otherwise preferred the features of competitors' server software.[50] The Court's reasoning is thus inconsistent with its conclusion that the Windows server technology is essential.

In evaluating whether Windows server technology was essential, the Court dismissed the existence of multiple competing server operating systems. The Court pointed out that Microsoft's market share had increased in comparison to that of its competitors Solaris, Netware, Unix, and Linux. The Court further considered whether Microsoft's server technology eliminated competition, again based on outcomes not conduct. The Court thus based its decision on Microsoft's market share in server operating systems as well as in

47 *Id.* at II-53-57.
48 *Id.* at II-62.
49 *Id.* at II-76.
50 *Id.* at II-82.

PC operating systems. This demonstrates that market outcomes rather than anticompetitive conduct are the basis of *Microsoft v. Commission*.

The Commission limited its market definition of server operating systems to those for a "small or medium-sized network."[51] The Court supported the Commission's definition of the relevant market based on demand-side and supply-side substitutability. The Court dismissed the evidence that companies with large networks employ multiple servers of different types, including mainframes. The Court distinguished between a company's activities that are mission critical and those that are not, with a corresponding assignment to larger-scale and smaller-scale servers. The Court buttressed its market definition by observing that Windows Server 2000 was available in multiple editions targeted at different market segments: Standard, Enterprise, Datacenter, and Web. The Court's support for the Commission's supply-side analysis of the market followed from its having already restricted the demand-side definition.

The Court's support of the distinct markets view is misguided. The use of diverse servers within a network is important since servers are substitutes in delivering services. Restricting attention to servers for smaller networks narrows the market definition in a manner that ignores customer decision-making. It should not matter that larger servers and smaller servers tend to handle different tasks within a network. The multiple capabilities make them effective substitutes for users. Market segmentation does not imply separate markets. Such segmentation supports the substitutability of the different types of servers. The fact that multiple servers are linked within a customer's IT network demonstrates that users can substitute small and large servers to deliver a variety of services. Thus, the Court's market definition seems artificially designed to identify a dominant position for Microsoft in a category of servers. This incorrect market definition also underlies the Court's view that elements of Microsoft's technology were essential facilities necessary for competition and innovation in servers.

The Court's competition analysis is logically inconsistent. Microsoft's dominance is said to be confined to a submarket of servers, namely servers for smaller work groups. If this were so, Microsoft's products could only survive in this market niche if its servers were fully interoperable since most companies operate networks with different types of servers. However, the Court found that Microsoft's failure to supply interoperability was an abuse of its dominant position in the market niche. Either Microsoft's server software is confined to this niche, in which case it must fully interoperate with that of competitors, or its position is not confined to this niche, in which case it competes within the larger market where it is not dominant. Although the Court tried to have it both ways, in fact Microsoft's server software competed within a larger market

51 *Id.* at II-91.

which was the proper definition of the server software market. Moreover, its products were fully interoperable with those of its competitors.

The Court made clear that it viewed particular elements of intellectual property as essential facilities. The Court noted that "the protocols whose specifications Microsoft is required to disclose in application of the contested decision represent only a minimum part of the entire set of protocols implemented in Windows work group server operating systems."[52] Armed with this information, Microsoft's competitors would not just reproduce the company's technology, they would improve upon it and offer differentiated products.[53]

The Court found that Microsoft "did not sufficiently establish that if it were required to disclose the interoperability information that would have a significant negative impact on its incentives to innovate."[54] To prove its case would require "specifying the technologies or products to which it thus referred."[55] By its very nature, however, innovation involves as yet unknown technologies and products. For a firm to show that disclosing IP would reduce its incentive to innovate, the Court imposed the impossible requirement of identifying what future inventions would not occur.

The Court rejected the claim that the Commission required disclosure of technology that went far beyond Sun's original request. Perhaps most surprisingly, the Court found it to be "irrelevant" that the requested technology was still under development.[56] For the Court, a company's "special responsibility" extends to disclosure of IP even before it has been developed. In addition, the Court found that the "special responsibility" extends to accepting reduced incentives to produce future IP, even if the technologies and products are not yet known.

B. *Windows Media Player*

Upholding the Commission's charge of "abuse of a dominant position," the Court found that Microsoft had tied its Media Player to its Windows operating system for PCs. The Court argued that streaming media players and the operating system are separate products and that consumers did not have the option of purchasing Windows without Media Player. The Commission sought to unbundle the Media Player application software from the Windows operating system. This charge was similar to the U.S. Department of Justice

52 *Id.* at II-122.

53 *Id.* ("Once they are able to use the information communicated to them to develop systems that are sufficiently interoperable with the Windows domain architecture, they will have no other choice, if they wish to take advantage of a competitive advantage over Microsoft and maintain a profitable presence on the market, than to differentiate their products from Microsoft's products with respect to certain parameters and certain features.").

54 *Id.* at II-128.

55 *Id.*

56 *Id.* at II-137.

(DOJ) case involving bundling of the Web browser Internet Explorer with the Windows operating system.[57]

1. The Court's Network Effects Theory

The Court asserted that because Media Player is already installed on most Windows PCs, which constitute a large share of the market, competition in media players would be foreclosed. The Commission relied on "indirect network effects" arguments based on questionable economic analysis. An "indirect network effect" refers to the effect of prices and features of complementary goods on a consumer's benefit from the network good. Liebowitz and Margolis demonstrate that such effects are handled by the market for complementary goods and therefore cannot be considered as "externalities."[58] The costs and benefits of the complementary goods are internalized in market transactions.

In the present instance, the network goods were the media players and the complementary goods were various types of content. The demand for a media player might reflect not only the features of the player but also the content that was available that conformed to the media player's format. Media players are differentiated products available without charge over the Internet. Consumers have an incentive to obtain one or more media players to benefit from their functionality and ability to play particular content.

The Commission's argument was that the ubiquitous presence of Media Player would discourage the creation and distribution of content in other formats. As a consequence, the Commission argued that competing providers of media players would be foreclosed since there would be no content in their format. The Court endorsed the "indirect network effects" theory.[59]

Assume for purposes of argument that indirect network effects theory is economically meaningful. Even so, the Commission's argument was fatally flawed. If content drives adoption of the media players, attractive content in a particular format would drive the adoption of a media player in that format. Content providers can count on consumers adopting a media player to have access to their content, even if media players were costly. In

57 *See* U.S. v. Microsoft Corp. 253 F.3d 34 (D.C. Cir. 2001).

58 *See* Stan J. Liebowitz & Stephen E. Margolis, *Network Externality: An Uncommon Tragedy*, 8 J. OF ECON. PERSPECTIVES 133 n.2 (1994) (pointing out that the argument that indirect network effects represent an "externality" repeats conceptual errors in Pigou's "pecuniary externality" concept); *see also* Stan J. Liebowitz, & Stephen E. Margolis, *Network Effects*, *in* 1 HANDBOOK OF TELECOMMUNICATION ECONOMICS 76 (M. E. Cave et al. eds., 2002). On bundling, see Stan J. Liebowitz, & Stephen E. Margolis, *Bundles of Joy: The Ubiquity and Efficiency of Bundles in New Technology Markets* (Northwestern Univ. Sch. of Law, Working Paper, 2007), *available at* http://ssrn.com/abstract=1069421.

59 *Microsoft*, 2007 E.C.R. at II-191.

practice, most major content providers offer consumers links to download the necessary media player.

The Commission wanted it both ways. Microsoft's Media Player would drive content providers to adopt their standard. Assume that this assertion is correct. If that were so, would not the attractive features of competing media players likewise drive content providers to adopt their competing standards?

The Commission's illogical argument must assume that Windows Media Player is somehow exceptional—that it influences content providers in a way that no other media player does. The Court signed on to this view: "consumers have an incentive to use Windows Media Player at the expense of competing media players, notwithstanding that the latter players are of better quality."[60] This requires consumers to be so irrational that they would pass up a better alternative even though it is available for free and with the ease of one click of a mouse. As it happens, consumers adopted competing media players, whether for their functionality or for their access to content. The fatal flaws in the Court's arguments were confirmed by the inaccuracy of their predictions.

The Court's decision and that of the Commission have little connection to events in the marketplace. There was no showing that consumers were harmed by Microsoft's offering Media Player or by its server software. Rather, Microsoft's products enjoyed consumer support within the EU. The proliferation of competing media players, from RealNetworks' Real Player to Apple's QuickTime, clearly demonstrated that Microsoft's Media Player was only one option among many available to consumers.[61] Competing media players were available as free downloads from the Internet. Interestingly, the Commission acknowledged that other players were popular with consumers and widely available in the marketplace. The competing players were installed on PCs by original equipment manufacturers (OEMs) and widely distributed by software developers and by content providers. This was presented only as evidence that Windows and Media Player formed a bundle of distinct products.

The Commission predicted that Microsoft's Media Player would dominate other forms of players on the basis of flawed arguments about "network effects."[62] Their argument was that because Windows was a dominant operating system it would create an unfair advantage for Media Player. Content providers would provide all of their content in the Media Player format. An absence of content would lead to the demise of all other players because they had different formats. Not surprisingly the prediction proved to be wildly

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60 *Id.* at II-174.

61 These included MusicMatch's Jukebox and Nullsoft's Winamp Media Player.

62 *See* Daniel F. Spulber, *Consumer Coordination in the Small and in the Large: Implications for Antitrust in Markets with Network Effects*, 4 J. COMPETITION L. & ECON., (forthcoming June 2008); Daniel F. Spulber, *Unlocking Technology: Innovation and Antitrust*, J. OF COMPETITION L. & TECH. (forthcoming 2008).

inaccurate, with the rise of Adobe Flash Player, Apple iTunes, and other market alternatives.

2. The Court's Product Definitions

The Commission argued that Microsoft's Windows operating system and its Media Player were separate products. It further maintained that Microsoft had "tied" Media Player to Windows without giving customers the option of purchasing Windows without also receiving Media Player. The Commission further maintained that Microsoft was dominant in the market for the tying product, Windows, and that the tie foreclosed competition in media players based on the theory of "network effects."

All products are to one extent or another bundles of features, functionalities, and components. Companies choose to assemble these bundles to form products based on competition with rival products, customer preferences over combinations of features, and transaction cost savings from offering convenience to customers. Companies frequently bundle together both complementary products (cameras and film) and substitute products (assortments of teas).

The Court pointed out that Windows is system software and Media Player is application software. This distinction has no economic content. An automobile is a similar bundle of components—a tire is not the same thing as a radio and there are separate individual markets for tires and radios. However, most consumers would prefer to buy a car that has tires and a radio. The unbundled version of Windows, without Media Player, proved to have practically no market demand.[63] The Court argued that "any doubts as to the effectiveness of the remedy ordered by the Commission do not in themselves prove that its finding as to the existence of two separate products is wrong."[64]

63 *See* Scott Bekker, *Windows XP N Stands for "No Sales"*, REDMONDMAG.COM, Oct. 7, 2005, http://redmondmag.com; *see also* Press Release, Microsoft, Fact Sheet: Windows XP N Sales (April 24, 2006), *available at* http://www.microsoft.com/presspass/legal/european/04-24-06windowsxpnsalesfs.mspx ("XP N sales represent 0.005 percent (1/20,000th of one percent) of overall XP sales in Europe; No PC manufacturers have ordered or preinstalled Windows XP N on PCs; Only 1,787 copies of Windows XP N have been sold to retailers and distributors in Europe; The number of copies actually purchased by consumers is not tracked; many may still be sitting on store shelves. The French retailer FNAC, the single largest retailer to order XP N representing 46% of the orders, has stated that it sees no consumer demand for Windows XP N; By comparison, 35.5 million copies of the fully functional version of Windows XP were sold in Europe during the same nine-month period."); Nicholas Economides, *The EU Microsoft Antitrust Case*, THE ONLINE MAG. FOR GLOBAL COMPETITION POLICY, Sept. 20, 2007, http://www.globalcompetitionpolicy.org/index.php?=&action=907&id=542 (stating that Windows-N sales were less than one percent of Windows sales, according to Microsoft).

64 *Microsoft*, 2007 E.C.R. at II-169.

3. Abusive Tying and Contracts with Original Equipment Manufacturers

The Court's understanding of foreclosure established a very low standard for abusive tying: competitors must be indistinguishable from incumbents. The Court found that the availability of multiple media players on their PCs would "confuse" consumers. Consumers would find it "complicated" to download competing media players from the Internet. Consumers would believe mistakenly that a preinstalled player would "work better" than one that they installed themselves. Consumer decisions would be held back by "inertia."[65]

Microsoft's contracts with OEMs did not restrict their ability to install competing media players or require them to promote Media Player. Nor did Windows limit the full interoperability of other media players. Microsoft provided technical information needed for interoperability to software and content developers. Most OEMs in fact installed RealPlayer and QuickTime, often installing two or more media players. Despite this, the Commission argued that its foreclosure arguments took into account the "likely reactions" of customers and competitors. For the Commission, simply offering Media Player as a free functionality took away the free choice of consumers.[66] Such reasoning is highly questionable since it has no limits. All functionalities of any product bundle in any industry could be construed as taking away the free choice of consumers. Firms identified as dominant cannot offer bundles of features—and thus cannot engage in normal business.

The Court's conclusion was that Microsoft's "abusive tying" had the "inevitable consequence" of "appreciably altering the balance of competition in favour of Microsoft and to the detriment of the other operators." By being bundled with Windows, the Court asserted, Media Player "automatically achieved a level of market penetration corresponding to that of the Windows client PC operating system and did so without having to compete on the merits with competing products."[67] The Court rejected cost efficiency justifications for bundling. The Court found that bundling would also deter innovation by competitors.[68] These conclusions were inconsistent both with market realities and with economic analysis that finds tying unlikely to foreclose competition.[69]

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65 *Id.* at II-185-86.

66 *Id.* at II-181 (citing Case T-65/98, Van den Bergh Foods v. Comm'n, 2003 E.C R. II-4653).

67 *Id.* at II-185-86.

68 *Id.* at II-196.

69 *See* Liebowitz & Margolis, *Bundles of Joy*, *supra* note 58.

II. The Court's Treatment of IP Rights Diminishes the Incentive to Innovate

Microsoft v. Commission raises important questions regarding the interplay between the objectives of competition policy and intellectual property rights. Achieving the objectives of an efficient competition policy does not require restriction of IP rights. Promoting competition requires innovative efficiency. Competition policy that results in an erosion of IP rights will diminish incentives to innovate and reduce competition. This Section presents the argument that protection of IP rights is necessary to preserve companies' incentive to innovate. The discussion establishes that *Microsoft v. Commission* represents a substantial reduction of IP rights. The resulting dynamic effects of the decision will be to reduce incentives to innovate.

A. *IP Rights Are Essential to Preserving the Incentive to Innovate*

Producing either a public good or a private good requires resources, such that both types of goods are in scarce supply. A public good by definition has two features that distinguish it from a private good.[70] First, a public good exhibits "non-rivalrous" consumption. If two consumers wish to consume a private good such as a cake, they must divide it in some way. Consuming the services of durable private goods such as an automobile not only involves wear and tear but only one consumer at a time can drive the car. In contrast, many consumers can enjoy the same information or the same broadcasted entertainment without interfering with each other's consumption.

Second, a public good exhibits "non-excludable" consumption. Making the good available to one consumer makes it available to all. As a consequence, the unit cost of distributing the good to one consumer is the same as distributing the good to many consumers. A broadcast can be received by everyone within the broadcast area. If producers cannot limit access to the good, consumers may have an incentive to free ride on the consumption of others.

Intellectual property is different from a public good. IP shares the non-rivalrous feature of public goods but unlike public goods, IP is excludable. Intellectual property includes scientific works protected by patents, creative works protected by copyright, brand names and symbols protected by trademarks, and trade secrets protected by contract and by statute. Trade secrets are technical and business information with economic value.

Intellectual products must be excludable to be regarded as property. Armen A. Alchian defines property rights as having three basic features: "(1) exclusivity of rights to the choice of use of a resource, (2) exclusivity of rights to the services of a resource, and (3) rights to exchange the resource at

70 P. A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. OF ECON. & STAT. 387, 387-89 (1954).

mutually agreeable terms."[71] All three features of property rights involve exclusion in some form. For an intellectual product to be considered IP, the three features of property rights must apply. Its owner must have exclusive rights to the choice of how to use the intellectual product. Its owner must have exclusive rights to the services of the intellectual product. Its owner must have the rights to transfer ownership of the intellectual product.

Removing any of these features of property rights from an intellectual product would make that product non-excludable. Since intellectual products are non-rivalrous in nature, making them non-excludable as well converts them to public goods. Competition policy that infringes on the rights of owners of IP thus converts the IP to a public good. Although the intellectual product itself may retain its economic value to society, such policies represent a taking of private property by government.

Competition policy that mandates access to an intellectual product necessarily infringes on property rights. Hence mandating access to IP destroys intellectual property rights. Mandatory licensing eliminates all three features of property rights for intellectual products. Mandatory licensing restricts the decisions of the owner regarding how to use the intellectual product. Mandatory licensing also restricts the exclusive use of the services of the intellectual product. Finally, mandatory licensing and accompanying restrictions that limit royalties or require "reasonable" royalties restrict the owner's right to sell the intellectual product at mutually agreed upon terms.

Public policymakers are tempted to infringe on IP rights because it appears desirable to convert intellectual products from private goods to public goods. It appears to be a public benefit to release intellectual goods from private ownership, thereby conferring on everyone the benefits of non-rivalrous consumption. Eliminating exclusiveness seems tempting because what was privately owned becomes freely available. Policymakers may believe that public welfare is enhanced by conferring the benefits of intellectual property on society. Government takings of intellectual property appear to some policymakers as less egregious than takings of physical property.

Some scholars have argued that intellectual property is fundamentally different than physical property. Lawrence Lessig argues that the "IP regime" consisting of patents and copyrights has expanded beyond what is justifiable. "The restrictions it imposes are artificial, in the sense that they don't promote progress, they simply benefit one person at the expense of another."[72] For Lessig, weakening IP rights assures the future of ideas because "free content fuels innovation."[73] However, the information commons raises problems. An

71 Armen A. Alchian, *Property Rights*, CONCISE ENCYCLOPEDIA OF ECON., http://www.econlib.org/library/Enc/PropertyRights.html.

72 LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 217 (2001).

73 *Id.* at 265.

information commons creates incentives to free ride while reducing incentives to create new intellectual products.

Competition policy should be guided by considerations of economic efficiency. Mandating access to IP through forced licensing or other means eliminates the owner's property rights. Therefore, mandating access to IP removes the beneficial aspects of property rights for intellectual products. As with any other resource, private property rights are the foundation of efficient markets. Private property rights to a resource allow markets to achieve allocative efficiency since markets allocate the resource to its highest value use. Private property rights to a resource allow markets to achieve dynamic efficiency. Dynamic efficiency refers to the efficient allocation of resources over time, particularly to efficient investment decisions. Individuals will invest in developing a resource only if they expect to benefit from their investment, through controlling the use of the resource, obtaining its services, and being able to exchange the resource in the marketplace.

For intellectual products, it is important to add innovative efficiency to the standard criteria of allocative and dynamic efficiency. Innovative efficiency refers to efficient allocation of resources to inventive and innovative activity. Inventive activity involves allocation of resources to R&D and the choice among uncertain projects based on expected benefits, costs, and risks. Innovative activity involves the commercialization of inventions and decisions about new products, manufacturing processes, and transaction methods. Government policies, such as antitrust regulation, that substantially alter incentives to innovate are likely to reduce innovative efficiency.

Innovative efficiency contains elements of allocative efficiency and dynamic efficiency. Effective markets for technology allocate intellectual property to the highest value users. With dynamic efficiency, firms make efficient investments in research, development, and commercialization of new technology. In addition, innovative efficiency requires that firms choose to bear the risks of exploring new areas and act creatively in the commercialization of new technologies. Effective protections for intellectual property are essential for innovation efficiency. Without such protections, firms may favor more incremental or replicative inventions than they would otherwise. Also, firms may be reluctant to commercialize some of their discoveries that will trigger competition policy actions that reduce their IP rights. Firms may delay or disguise their innovations to reduce government scrutiny and takings of their IP.

Mandated access to intellectual products takes many forms. A classification framework developed for access to networks can be adapted to examine access to intellectual products.[74] The access framework adapts readily

74 *See* Daniel F. Spulber & Christopher S. Yoo, *Network Regulation: The Many Faces of Access*, 1 J. COMPETITION L. & ECON. 635 (2005); *see also* DANIEL F. SPULBER & CHRISTOPHER S. YOO, NETWORKS IN TELECOMMUNICATIONS: ECONOMICS AND LAW (forthcoming 2008) (discussing

to intellectual products. Retail access to intellectual products is provided through licensing to final customers, while wholesale access and unbundled access are provided through licensing to competitors. Unbundled access to intellectual products is provided by licensing and disclosure of information that is an element or component of an intellectual product. Platform access means that the intellectual products conform to a technological standard that allows other companies to provide complementary services. Platform access to intellectual products that is available to any and all suppliers of complements constitutes open access, such as open source software. Finally, interconnection access for intellectual products refers to reciprocal interoperability agreements.

The classification framework for access to IP is useful for understanding *Microsoft v. Commission*. The case entails three main forms of access: unbundled, platform, and interconnection. Perhaps most significantly, the case requires unbundled access to IP since Microsoft was required to supply information about a software element to its competitors in server software, namely Active Directory. Also, unbundled access involved compulsory licensing of technology to open source software developers. The case required platform access since Microsoft had to supply technology licenses and provide compatibility to providers of complementary services, particularly manufacturers of servers. The case also involved interconnection access through interoperability agreements with competitors.

Consumption of intellectual products is non-rivalrous since usage does not deplete inventions, as already noted. Access to intellectual property is rivalrous, however, because usage depletes the IP's economic returns. Mandating access to IP eliminates the ability of original owners to control how they are used or to benefit from market transactions. In this way, regulated access to IP is closely related to access to networks. Regulated networks for telecommunications, transmission, and transportation are composed of physical and virtual facilities. These facilities have scarce capacity so that consumption of the services of these facilities is rivalrous. The costs of granting competitors access to scarce facilities include the opportunities foregone by the owner of those facilities. Regulating access to IP depletes their scarce economic value, dispersing economic rents among competing users. In the same way, the costs of licensing IP to competitors include the economic opportunities foregone by the owners of the IP.

As a consequence, mandating access to IP reduces incentives to innovate in two ways. First, any firm in the industry will have reduced incentives to

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that there are five main types of access: (1) retail access, (2) wholesale access, (3) unbundled access, (4) platform access, and (5) interconnection access. Retail access is provided to final customers, while wholesale access and unbundled access are provided to competitors. Platform access means that the network facilities conform to a standard that allows other companies to provide complementary services. Platform access that is available to any and all suppliers of complements constitutes open access. Interconnection access refers to reciprocal connection agreements between networks that provide access to each other's facilities, forming a larger network in the process); Spulber & Yoo, *Mandating Access to Telecom and the Internet: The Hidden Side of Trinko*, *supra* note 39.

innovate since any successful innovation risks triggering antitrust action. In addition to fines and legal costs, the firm faces the possibility that regulators will give competitors access to its IP. Second, competitors of the firm that grants access to its IP will have less incentive to innovate since they will receive access to the innovation without any innovative effort. The possibility of free riding will lower incentives to innovate for all firms. With reduced incentives to innovate, firms will choose to compete along other competitive dimensions such as pricing, marketing, sales, and complementary services.

B. *Effects of* Microsoft v. Commission *on IP Rights and the Incentive to Innovate*

Microsoft v. Commission is closely related to other Article 82 cases that came before the Court of Justice of the European Communities (ECJ) and the Court of First Instance.[75] Several of these cases established precedents in the area of intellectual property. The ECJ found in *Magill* that the BBC, RTE, and ITV abused their dominant market position by not licensing their copyright to their television program listings to an independent publisher.[76] The ECJ found subsequently in *IMS Health* that IMS abused a dominant position by not providing access to a copyrighted database method used in pharmaceutical sales. These cases established the notion that failure to provide IP was exclusionary behavior.[77]

In contrast, the ECJ found in *Volvo v. Veng* that Volvo did not abuse its dominant position when it would not license its designs for auto body panels to a parts supplier. The ECJ stated that a refusal to grant a license to a protected design was not in itself abuse of a dominant position, and forced licensing even at a reasonable royalty would deprive the owner of the IP the "very subject-matter of his excusive right."[78]

Microsoft v. Commission extends the approach to IP taken in *Magill* and *IMS Health*, while rejecting the limitations of *Volvo v. Veng*. The Commission ordered Microsoft "to disclose interoperability information for the development of interoperable products."[79] This Commission's stated objective was "to ensure that Microsoft's competitors can develop products that interoperate with

75 These cases include Case C-418/01, IMS Health v. NDC Health, 2004 E.C.R. I-5039; Case C-551/03 P, General Motors BV v. Comm'n, 2006 E.C.R. I-3173; Case C-7/9, Bronner v. Mediaprint, 1998 E.C.R. I-7791; Joined Cases C-241/91 P & C-242/91 P, RTE & ITP v. Comm'n, 1995 E.C.R. I-743; Case 238/87, AB Volvo v. Erik Veng, Ltd., 1988 E.C.R. 6211; Case 311/84, CBEM v. CLT & IPB, 1985 E.C.R. 3261; Case 27/76, United Brands Co. & United Brands Continental BV v. Comm'n, 1978 E.C.R. 207; Case 102/77, Hoffmann-La Roche v. Centrafarm, 1978 E.C.R. 1139; Joined Cases 6/73 & 7/73, Commercial Solvents v. Comm'n, 1974 E.C.R. 223; Joined Cases T-125/03 & T-253/03, Akzo Nobel Chem. Ltd. v. Comm'n, 2007 O.J. (C269/43); and Case C-205/03 P, Federación Española de Empresas de Tecnología Sanitaria (FENIN) v. Comm'n, 2006 O.J. (C212/1).

76 Joined Cases C-241/91 P & C-242/91 P, RTE & ITP v. Comm'n, 1995 E.C.R. I-743, I-825.

77 Case C-418/01, IMS Health v. NDC Health, 2004 E.C.R. I-5039, I-5087-88.

78 Case 238/87, AB Volvo v. Erik Veng, Ltd., 1988 E.C.R. 6211, 6235.

79 *Commission Decision*, *supra* note 1, at 277.

the Windows domain architecture . . . and hence viably compete with Microsoft's work group server operating system."[80] The order goes on to require that Microsoft not only disclose specifications but also authorize its competitors to implement the specifications in work group server operating system products.[81] The Commission's decision reduces existing legal protections for intellectual property. As a consequence, the resulting competition policy may be expected to impact adversely innovative efficiency in markets for technology.

The Commission's decision turns on the meaning of a single critical word: interoperability. For its definition, the Commission cites the "Software Directive":

> Whereas the function of a computer program is to communicate and work together with other components of a computer system and with users and, for this purpose a logical and, where appropriate, physical interconnection and interaction is required to permit all elements of software and hardware to work with other software and hardware and with users in all the ways in which they are intended to function;
>
> Whereas the parts of the program which provide for such interconnection and interaction between elements of software and hardware are generally known as 'interfaces';
> Whereas this functional interconnection and interaction is generally known as 'interoperability'; whereas such interoperability can be defined as the ability to exchange information and mutually to use the information which has been exchanged.[82]

The Commission stated that, "[i]n any case, the issue at stake in this case is ultimately the question whether, *pursuant to Article 82 of the Treaty*, Microsoft provides to its competitors in the work group server operating system market the interoperability information that it has a special responsibility to provide."[83]

The Software Directive's definition of interoperability is suitably general for developing an intuitive understanding of computer systems. Problems arise, however, when the definition is applied as a characterization of intellectual property. The problem is that all computers are information processing devices. Computers exchange information and process that information both internally and externally. Internally, computers move and process data and manage interaction between software and hardware. Externally, computer networks move and process data and manage interaction between multiple types of

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80 *Id.* at 278.

81 *Id.*

82 Council Directive 91/250/EEC of 14 May 1991 on the Legal Protection of Computer Programs, 1991 O.J. (L122) 42, 42-46 (EC).

83 *Commission Decision*, *supra* note 1, at 12.

software elements, multiple types of computers, and peripheral equipment such as printers.

Interoperability, thus defined, is practically everything that computers do. Applying the Software Directive as a definition of intellectual property would extend protections to practically all functional interconnection and interaction within a firm's computer products, both hardware and software. This might be viewed as an overly extensive definition of IP that could prevent the development of standards for interoperability of products offered by different firms.

Conversely, applying the Software Directive as a means of identifying information that a firm should disclose would remove practically all IP protections. Requiring firms to disclose almost all functional interconnection and interaction to competitors would represent the end of IP in information technology markets.

The Commission acknowledged that interoperability is a matter of degree.[84] The spectrum of possibilities presumably extends between full IP protections to complete disclosure of information without any IP protections. Microsoft argued that the Commission's charge of abuse of dominance would upset the "careful balance between copyright and competition policies" struck by the Software Directive.[85] The Commission responded that this balance could be changed because competition policy under Article 82 superseded copyright policy under the Software Directive.[86] The Commission argued that, in any case, the Software Directive "limits a copyright-holder's rights in favour of interoperability, whether the copyright-holder is dominant or not."[87] Adding in Microsoft's dominant market position, the decision "establishes that Microsoft has an obligation to *actively* supply interface information to other work group server operating system vendors."[88]

The question is where does operation of a software program end, and where does interoperation of distinct software programs begin? Interoperability allows distinct computers and software programs to work together, even when they are provided by different firms. The Commission's definition goes far beyond interconnection and interaction, however. Its view of interoperability requires sufficient disclosure of IP such that a firm's program must interact with a competitor's program with all available functionalities.[89] In practice, accomplishing such "full interoperability" essentially eliminates product differentiation. To achieve such full interoperability likely requires some disclosure of the source code of the initial program. The competitor can appropriate all the information to construct a nearly identical program that

84 *Commission Decision*, *supra* note 1, at 12.

85 *Id.* at 199 (citing Microsoft submission of Nov. 17, 2000, Annex Y on page 1).

86 *Id.*

87 *Id.* at 199.

88 *Id.* at 200 (emphasis in original).

89 *Id.* at 140.

functions in the same way. Interoperability becomes a justification for compelling disclosure of information, including a firm's product innovation.

The Commission's competition policy influenced the IT marketplace. This is evidenced by the relationship between Microsoft and Sun. In 2004, Microsoft and Sun formed a ten-year business and technology alliance. Microsoft paid two billion dollars to Sun, which dropped its U.S. antitrust suit against Microsoft. The Sun-Microsoft alliance was extended in September 2007 when Sun agreed to resell and install Windows on some of its servers. These were servers based on Intel's x86 and Xeon microprocessors and on Advanced Micro Devices's (AMD) Opteron microprocessors. The deal did not yet extend to Sun's servers based on its SPARC microprocessors, which were the majority of Sun's sales.[90]

Beginning in 2004, Sun and Microsoft had worked together on Internet services, particularly interoperability between Microsoft's .Net System and Sun's Java technology.[91] The alliance also served customers who used both Windows and Solaris, Sun's operating system software for managing databases and e-commerce.[92] Each company's operating system would function using the other company's "virtualization" software, which is a technique for simultaneously running multiple operating systems on the same computer.[93] Sun, whose software is Unix-based, benefited from the alliance by gaining a competitive response to the open-source Unix-based Linux software.

Sun stated that the 2004 agreement would "satisfy the objectives" of its European Commission complaint against Microsoft.[94] Sun's licensing of Windows communications protocols followed terms established under the U.S. Department of Justice consent decree. The agreement required the resolution of complex IP issues, because both companies held many patents for their respective technologies, including patents on proprietary communications protocols required for interoperability between .Net and Java.[95] Microsoft's lead attorney Brad Smith speculated that Microsoft's agreement with Sun "underscores our commitment to achieve interoperability," adding that "I think the European case has a life of its own."[96]

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90 Peter Burrows, *Sun Opens a Door, Sells Windows*, BUS. WK. ONLINE, Sept. 13, 2007, http://www.businessweek.com/technology/content/sep2007/tc20070912_969985.htm.

91 *Id.*

92 *Id.*

93 Christopher Lawton & Don Clark, *Sun is Warming Up to Windows*, WALL ST. J., Sept. 13, 2007, at B4.

94 Stephen Shankland, *Sun Settles with Microsoft, Announces Layoffs*, Apr. 2, 2004, CNET NETWORKS, http://www.news.com/2100-1014_3-5183848.html.

95 Stephen Shankland & Ina Fried, *Settling Down?*, Oct. 12, 2004, CNET NETWORKS, http://www.news.com/Settling-down/2008-1014_3-5184274.html.

96 *Id.* Smith further observed that "I don't think that the fundamental dynamic of the case is going to change, because it is now the European Commission that is proceeding, and they'll make up their own minds, based on their own assessment of the situation."

These marketplace developments illustrate the effects of *Microsoft v. Commission* on firms' incentives to innovate. These effects are not specific to Microsoft or Sun and they transcend the IT industry. Because of the importance of the European market and the ability of the EU to serve as a forum for complaints and legal action, the dynamic effects of the decision are not limited to the EU. Companies worldwide have greater incentives to cooperate and reduced incentives to compete. Companies face increased incentives to obtain technology from competitors and reduced incentives to develop new technology.

Because of the significant erosion of IP rights for successful companies, the returns to investment in R&D are diminished for all companies. The returns for successful companies are eroded because these companies face the prospects of legal challenges with the accompanying legal costs and public relations problems. If they are found to have abused their dominant market position by not licensing their technology voluntarily to competitors, these companies face financial penalties and compulsory licensing. At a minimum successful companies that do business in Europe will weigh these risks in deciding whether or not to invest in product and process R&D. If successful companies happen to have made scientific and technical discoveries, these companies will weigh the risks in deciding whether or not to commercialize these discoveries.

Successful companies will not just compare the costs of R&D with the financial benefits of R&D. They will instead discount the benefits of R&D by taking into account the likelihood that they will need to give away the IP. The companies will then subtract the potential costs of litigation and fines associated with mandated licensing. Successful companies will take into account the additional payments they will need to make to competitors that pursue antitrust litigation by taking their complaints to the European Commission. These considerations certainly will impact R&D projects whose net benefits would be positive but close to the margin of acceptable projects. The result will be fewer resources devoted to R&D, resulting in less innovation. This should raise concerns because successful companies are those most likely to have substantial R&D budgets and are those most likely to have a portfolio of discoveries. The reduction in innovation will make consumers worse off throughout the world economy.

Even companies that are nearly successful will be deterred from R&D if a potential innovation will propel them to the top of their market segment. They will consider whether the innovation will draw the attention of competition policy regulators and competitors who might file complaints. The result will be a desire to remain within the herd rather than seeking to distinguish the firm's products. This will reduce the incentive to innovate even for firms that do not have dominant market shares.

Microsoft v. Commission breaks new ground by requiring disclosure of technology before it is even created. Successful companies have incentives for

greater secrecy when competitors can request technology still under development. Because their competitors can seek regulations that unbundle the elements of an invention, companies have additional incentives to pursue defensive R&D strategies that protect their IP from the scrutiny of their competitors. The result will be less interoperability and reduced communication of scientific and technical information within industries. Reduced communication of discoveries and R&D efforts will diminish incentives to innovate. The end result of eroding IP protections is to change the nature of innovation. Legal implications rather than scientific and commercial considerations will guide innovation decisions.

III. The Connection Between International Trade and Innovation

Microsoft v. Commission is much more than competition policy—it is a complement to European trade policy. The interaction between competition policy and trade policy is well understood by European policymakers. Neelie Kroes, European Commissioner for Competition Policy, observed that "An active EU trade policy—including international discipline on subsidies—is therefore a necessary complement to internal competition policy."[97] According to Kroes, "European competition and trade policy must act in tandem" to pursue, among other objectives, "[p]rotecting European consumers and businesses from the harmful effects of global cartels, monopolies and restrictive agreements."[98]

Kroes recognized that trade restrictions resulting from competition policy could reduce consumer welfare

> Shielding off European companies from competition through artificial entry barriers is also the wrong approach because put quite simply it will not work. Companies shielded from competition at home cannot hope to compete abroad. And it is the domestic customers of those companies that end up paying the price: less innovative products, less choice, higher prices.[99]

Despite these potential welfare effects for consumers, Kroes argued that competition policy and trade policy should "act in tandem" to protect European businesses from monopolies. Protecting European businesses from an abuse of a dominant position not only means protection of competition, but protection of competitors.

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97 Neelie Kroes, European Commissioner for Competition Policy, Speech to the 2nd Lisbon Conference on Competition Law and Economics in Lisbon: Helping Europeans Get the Best Deal: A Sound Competition Policy for Well-functioning Markets (Nov. 15, 2007), *available at* http://ec.europa.eu/commission_barroso/kroes/speeches_en.html.

98 Neelie Kroes, European Commissioner for Competition Policy, Speech at the Women in European Business Conference in Frankfurt: Global Europe Competing and Cooperating (Oct. 11, 2007), *available at* http://ec.europa.eu/commission_barroso/kroes/speeches_en.html.

99 Kroes, *supra* note 97.

This Section demonstrates how international trade enhances the incentive to innovate. The discussion shows how the competition policy expressed in *Microsoft v. Commission* represents a form of protectionist trade policy. The potential dynamic effect of such protectionist trade policy is a reduction of the beneficial effects of international trade on the incentive to innovate.

A. *How International Trade Enhances the Incentive to Innovate*

International trade interacts in significant ways with the incentive to innovate. Technology is traded internationally embodied in the form of innovative products and services as well as in the form of technology licenses. Adam Smith extolled the benefits of international trade by pointing out that economies of scale depend on the extent of the market. Paul Krugman found that by expanding the market, international trade improves product variety.[100] I show elsewhere that by expanding the market, international trade improves the quality of innovation.[101]

International trade widens the extent of the market for inventions and for innovative products. This increases the size of the pool of R&D experiments from which the best technology is chosen. Technology trade increases the efficiency of invention while at the same time lowering the total number of inventors relative to the equilibrium without technology trade. Technology trade increases the volume of trade in goods. Technology trade increases product variety at the market equilibrium. Technology trade increases national income in each country and increases total gains from trade.

Technology trade increases the expected value of trade in goods between countries. Technology embodied in the form of products such as computers, software, consumer electronics, medical equipment, machine tools, automobiles, and other goods contributes significantly to international trade. There is much less international trade in technology in the form of IP. However, international trade in IP is substantial in comparison to R&D expenditures for countries in the Organization for Economic Cooperation and Development (OECD).[102] The growth in technology trade suggests that

100 *See* Paul R. Krugman, *Increasing Returns, Monopolistic Competition, and International Trade*, 9 J. INT'L ECON. 469 (1979).

101 For a theoretical analysis of these issues see Daniel F. Spulber, *Innovation and International Trade in Technology*, 138 J. ECON. THEORY 1 (2008) (analyzing the international technology market and the economic effects of international trade in technology). The discussion in this Section draws from that article.

102 *See* ORG. ECON. COOPERATION DEV. (OECD), SCIENCE, TECHNOLOGY AND INDUSTRY SCOREBOARD 83-90 (2007) (presenting data on the technology balance of payments in OECD countries). The data covers unaffiliated and affiliated transfers of disembodied technology including patents (purchases, sales), licenses for patents, know-how (not patented), models and designs, trademarks (including franchising), technical services, and finance of industrial R&D outside national territory. *Id.* at 199 (showing that the average of technological payments and receipts exceeded 0.5% of GDP in the OECD countries in 2005). *Id.* at 24 (stating that domestic R&D expenditures were about 2.2% of GDP in the OECD countries in 2005).

international technology transfers create potentially significant gains from trade and that such gains are likely to be distinct from those based on the exchange of goods and services. Technological knowledge provides demand-side economies because knowledge can be transferred at relatively low cost and applied by multiple users. International trade in technology allows multiple countries to combine R&D efforts and to employ the same innovation. Countries can achieve gains from trade not only by exchanging products but also by transferring knowledge.

Technological advances contribute to international trade through enhanced products and services. In addition, the international market in disembodied technology includes both arms-length transfers between firms, such as sales of licenses, and internal transfers within multinational firms. Research on trade and endogenous growth identifies numerous economic benefits from international technology transfer.[103] Economic historians have long emphasized the importance of the creation and exchange of knowledge in promoting economic development.[104]

The significance of the connection between technology and international trade is evidenced by increases in the number of R&D laboratories that multinational corporations choose to locate abroad, with R&D performed outside of the company's home country.[105] Companies have established international networks and alliances for cooperative R&D, some involving

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103 *See* Judith. C. Chin & Gene. M. Grossman, *Intellectual Property Rights and North-South Trade, in* THE POLITICAL ECONOMY OF INTERNATIONAL TRADE 90 (Ronald Jones & Anne Krueger eds., 1990) (presenting a theoretical analysis in which some countries benefit from international technology transfer by pirating R&D that originates in other countries); Jonathan Eaton & Samuel S. Kortum, *International Technology Diffusion: Theory and Measurement*, 40 INT'L ECON. REV. 537, 537-70 (1991) (presenting a dynamic model of international technology diffusion with endogenous R&D in which ideas diffuse across countries with an exogenously specified lag and countries then adopt the best technology. Eaton and Kortum allow inventors to decide on how much to patent in order to capture rents from invention even though patenting does not affect the rate of diffusion); Luis A. Rivera & Paul M. Romer, *Economic Integration and Endogenous Growth*, 106 Q. J. OF ECON. 531, 531-555 (1991) (showing that economic integration between countries can be achieved by increasing trade in goods or by increasing the flow of ideas); M. Scott Taylor, *Trips, Trade and Growth*, 35 INT'L ECON. REV. 361 (1994) (showing in a two-country model the importance of intellectual property protections for international trade, economic growth, and technology transfer); *see also* GENE M. GROSSMAN & ELHANAN HELPMAN, INNOVATION AND GROWTH IN THE GLOBAL ECONOMY 200-05 (1991) (pointing out that an innovative firm can license an invention abroad as a means of taking advantage of factor price differences while avoiding the costs of setting up a plant abroad).

104 *See* WILLIAM M. LANDES, THE UNBOUND PROMETHEUS: TECHNOLOGICAL AND INDUSTRIAL DEVELOPMENT IN EUROPE FROM 1750 TO THE PRESENT (1969); NATHAN ROSENBERG, PERSPECTIVES ON TECHNOLOGY (1976); Moses A. Abramovitz, *Catching Up, Forging Ahead and Falling Behind*, 46 J. ECON. HIST. 385, 385-406 (1986).

105 Jeremy Howells, *The Internationalization of R&D and the Development of Global Research Networks*, 24 REGIONAL STUD. 495 (1990); OECD, RECENT TRENDS IN THE INTERNATIONALISATION OF R&D IN THE ENTERPRISE SECTOR (2008), *available at* http://www.oecd.org/dataoecd/27/59/40280783.pdf; David Mowery & David J. Teece, *Japan's Growing Capabilities in Industrial Technology: Implications for U.S. Managers and Policymakers*, 35 CAL. MGMT. 9, 9 (1993); Richard Florida & Martin Kenney, *The Globalization of Japanese R&D: The Economic Geography of Japanese R&D Investment in the United States*, 70 ECON. GEOGRAPHY 344 (1994).

governments and universities. The growing international trade in technology is reflected in strengthened international agreements on intellectual property such as the World Trade Organization's (WTO) agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and increased patenting of the same invention in multiple countries to establish patent families.

International trade in technology leads to global competition among inventors by connecting markets. Inventions are substitutes for each other and differ in terms of the efficiencies that they provide.[106] International trade in technology has a number of important properties.[107] First, when countries combine innovative efforts through trade, markets choose the best technology from a combined pool of experiments, making a better technology more likely than would be obtained from separate sets of experiments.[108] International trade in goods that embody technology or in technology licenses effectively connects inventors by pooling experiments across countries. By widening the number of inventors that compete with each other, international trade in technology improves the expected performance of the best innovation.

Second, technology trade stimulates the entry of inventors, leading to more total inventors than there were in either country without technology trade because the rewards of inventors depend on net returns obtained in the combined markets. Inventors earn returns by selling their inventions in both countries. However, because pooled invention is more efficient, the total number of inventors in equilibrium with technology trade is less than the total number of inventors that enter without technology trade. Thus, technology trade lowers the total cost of invention while raising the quality of the expected outcome of invention.

Third, technology trade increases each country's national income by raising its supply of human capital. Technological change enhances the productivity of labor, or equivalently the supply of human capital. Technology trade increases the quality of the best innovation. This increases human capital relative to R&D without technology trade.

Fourth, technology trade increases the expected value of trade in goods. The value of trade in goods for each country is equal to its import share of goods traded. The expectation of the import share is increased because of the greater efficiency of invention with international trade in technology. Increases in human capital and reductions in the total costs of invention increase the value of product trade.

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106 The model of competition among inventors in Spulber, *supra* note 101, is from the classic work by Arrow in which an inventor is assumed to have a monopoly over his invention. *See* Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* NATIONAL BUREAU OF ECONOMIC RESEARCH: THE RATE AND DIRECTION OF INVENTIVE ACTIVITY (1962).

107 These are shown in Spulber, *supra* note 101.

108 *See* Richard R. Nelson, *Uncertainty, Learning, and the Economics of Parallel Research and Development Efforts*, 43 REV. ECON. & STAT. 351, 363 (1961) (noting the benefits of a larger pool of inventors).

Fifth, technology trade increases the expected variety of goods traded in equilibrium. The international product market is described by a model of monopolistic competition. The countries trade differentiated products and derive benefits from intraindustry trade because customers prefer product variety and there are economies of scale in production. The number of products produced in each of the two countries and the corresponding level of product trade depend on the supplies of human capital in the two countries. By increasing supplies of human capital, technological change increases product variety.

Finally, international trade in technology creates gains from trade in comparison to a market equilibrium without technology trade. Technology trade increases human capital by enhancing the productivity of labor in both countries. The gains from trading technology enhance the benefits obtained from trading a greater variety of products than are produced with economies of scale. Technology trade increases the expected gains from trade by increasing product variety relative to product trade without international trade in technology.[109] Technology trade improves the expected productivity of labor in both countries thus increasing product variety. Population growth in either country can increase gains from trade because population growth increases the total number of inventors at the market equilibrium with international trade in technology. Product variety increases and expected gains from trade increase due to the improved realization of the best technology. This discussion illustrates how international markets for technology create gains from trade.

Economists have studied the effects of international technology transfer extensively. Such transfers often are referred to as "spillovers," which can designate a range of international transfer mechanisms including market-mediated technology diffusion, human capital mobility, imitation, copying, and education, training, and scientific exchanges. Some non-market transfers of technology across countries result from imperfections in international protections for intellectual property. However, much of international IP transfers take place through trade in technology that is embodied in goods and

109 *See* David Hummels & Peter J. Klenow, *The Variety and Quality of a Nation's Exports*, 95 AM. ECON. REV. 704 (2005) (discussing these gains' contrast with traditional Ricardian comparative advantage in which trade is driven by productivity differences between countries). In the Ricardian setting, technology differences result in countries having comparative advantages in goods, so that specialization in production and exchange of goods generates gains from trade. Hummels, Klenow and others criticize monopolistic competition models of trade as unrealistic because of the assumption that all countries consume all goods and the way that country size affects the number of products a country exports. In a Ricardian model, where international trade takes place due to relative productivity differences across goods, product-specific innovation that narrows productivity gaps across countries may reduce the number of goods traded, particularly in the presence of trade costs. However, even in a Ricardian setting, inventions that increase human capital and thus increase the effective size of the labor force, yielding neutral technological progress as in the present setting, may still increase the volume of trade.

through internal transfers within multinational corporations.[110] International transfers within multinational companies can entail transaction costs.[111]

Empirical results show that productivity is increased by foreign R&D through various types of spillover effects. Eaton and Kortum examine patenting and the effects of technology transfer in the OECD. They suggest that in comparison with growth studies on the effects of technological change on worker productivity, "Where technological change originates and how it spreads across countries is less well understood." They point out that other than the five leading research economies (U.S., Japan, the U.K., Germany, and France), all other OECD countries obtain over 90 percent of their productivity growth from ideas that originated abroad. They specify diffusion as rates at which ideas flow between country pairs and estimate the diffusion parameters and their effects on economic growth.[112] Eaton and Kortum extend this analysis by examining the gradual diffusion of technological advances. In the five leading research economies, the U.S. and Japan contribute two-thirds or more to growth, and only the U.S. obtains most of its growth from its own innovation.[113] The level and composition of international trade in goods is

110 The growth of international markets for technology is reflected in numerous studies of market transfers of knowledge. *See* ASHISH ARORA ET AL., MARKETS FOR TECHNOLOGY: THE ECONOMICS OF INNOVATION AND CORPORATE STRATEGY (2001) (discussing evidence on the existence of international markets for technology and providing extensive analysis of the chemical industry); Bharat Anand & Tarun Khanna, *The Structure of Licensing Contracts*, 48 J. INDUS. ECON. 103 (2000) (discussing the many international licensing agreements in chemicals, electronics and computers); Ashish Arora et al., *Specialized Technology Suppliers, International Spillovers and Investment: Evidence from the Chemical Industry*, 65 J. DEV. ECON. 31 (2001) (discussing that specialized engineering firms in the chemical industry play a significant role in market transfers of technology transfer through engineering consulting services); Lynne M. Zucker et al., *Geographically Localized Knowledge: Spillovers or Markets?*, 36 ECON. INQUIRY 65 (1998) (discussing evidence of market-mediated transfers of biotechnology); *see also* John E. Tilton, INTERNATIONAL DIFFUSION OF TECHNOLOGY: THE CASE OF SEMICONDUCTORS (1971); Peter C. Grindley & David J. Teece, *Managing Intellectual Capital. Licensing and Cross-Licensing in Semiconductors and Electronics*, 39 CAL. MGMT. REV. 8 (1997) (discussing licensing in the international diffusion of semiconductors and electronics).

111 *See* David J. Teece, *Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-How*, 87 ECON. J. 242 (1997).

112 *See* Jonathan Eaton & Samuel Kortum, *Trade in Ideas: Patenting and Productivity in the OECD*, 40 J. INT'L ECON. 251 (1996); *see also* Jonathan Eaton & Samuel Kortum, *Technology, Trade, and Growth: A Unified Framework*, *in* 45 EUROPEAN ECON. RE.: PAPERS AND PROCEEDINGS 742 (2001).

113 *See* Jonathan Eaton & Samuel S. Kortum, *International Technology Diffusion: Theory and Measurement*, 40 Int. Econ. Rev. 537 (1999). Additional empirical studies of technology transfer include Jeffrey I. Bernstein & Pierre Mohnen, *International R&D Spillovers Between U.S. and Japanese R&D-Intensive Sectors*, 44 J. INT'L ECON. 315 (1997); David T. Coe & Elhanan Helpman, *International R&D Spillovers*, 39 EUROPEAN ECON. REV. 859 (1995); Hans J. Engelbrecht, *International R&D Spillovers, Human Capital and Productivity in OECD Economies: An Empirical Investigation*, 41 EUROPEAN ECON. REV. 1479 (1997); Walid Hejazi & A. Edward Safarian, *Trade, Foreign Direct Investment and R&D Spillovers*, 30 J. INT'L BUS. STUD. 491 (1999); Pierre Mohnen, *International R&D Spillovers and Economic Growth*, *in* INFORMATION TECHNOLOGY, PRODUCTIVITY, AND ECONOMIC GROWTH: INTERNATIONAL EVIDENCE (Matti Pohjola ed., 2001); Bin Xu & Jianmao Wang, *Capital Goods Trade and R&D Spillovers in the OECD*, 32 CANADIAN J. OF ECON. 1258 (1999); and Bin Xu & Jianmao Wang, *Trade, Foreign Direct Investment and International Technology Diffusion*, 15 J. ECON. INTEGRATION 585 (2000).

associated with benefits from technology spillovers. Again, such effects can be due to market-mediated technology transfers within and between firms.[114]

Foreign direct investment (FDI) commonly is identified as a mechanism for enhanced productivity that is explained as a technology spillover. Increased FDI may be associated with greater market transfers of knowledge, which includes internal transfers within multinational corporations, as well as technology sales by foreign subsidiaries of multinational corporations. FDI effects on productivity also may indicate movement of human capital from the subsidiaries of multinational corporations to local companies. FDI effects also can indicate learning and imitation of the multinational corporation subsidiary by local companies.[115] FDI provides a means of internalization of technology that allows firms to exercise greater control over the transfer and usage of their technology in comparison with licenses. Mansfield identifies FDI closely with knowledge transfers, noting that decisions about both FDI and licensing depend on the extent of international protections for intellectual property.[116]

When international technology transfer is protected by intellectual property rights, the incentive to invent is likely to increase since companies obtain rents by selling technology licenses or by employing the technology with less competition from technology diffusion. When international technology transfers take place outside of the market, research and development and product trade generate positive externalities. This potentially implies economic inefficiency because inventors' efforts only reflect their private benefits but not the social benefits of invention. To capture the rents from invention, firms will seek ways to exclude access to their technology so as to capture these gains through market transfers.

There are various types of intellectual property protections in international markets. First, intellectual property rights are well recognized within many national economies and protected through various legal means including copyrights, trademarks, and patents. Owners of intellectual property can obtain legal protections in multiple countries, for example inventors can obtain patents

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114 *See* Coe & Helpman, *supra* note 113; Xu & Wang, *Trade, Foreign Direct Investment and International Technology Diffusion*, *supra* note 113 (finding related import effects from trade in capital goods); *see also* Jonathan Eaton & Samuel Kortum, *Technology, Geography and Trade*, 70 ECONOMETRICA 1741 (2002) (formulating and testing a multi-country Ricardian trade model in which the benefits of technological innovation are realized through trade in goods rather than trade in technology itself).

115 For studies of FDI and technology transfer *see, e.g.*, Steven Globerman et al., *International Technology Diffusion: Evidence From Swedish Patent Data*, 53 KYKLOS 17 (2000); Frank Lichtenberg & Bruno van Pottelsberghe de la Potterie, *Does Foreign Direct Investment Transfer Technology Across Borders?*, 83 REV. ECON. & STAT. 490 (2001); Bin Xu, *Multinational Enterprises, Technology Diffusion and Host Country Productivity Growth*, 62 J. OF DEV. ECON. 477; Xu & Wang, *Trade, Foreign Direct Investment and International Technology Diffusion*, *supra* note 113; and Lee Branstetter, *Is Foreign Direct Investment a Channel of Knowledge Spillovers? Evidence from Japan's FDI in the United States* (NBER Working Paper No. 8015, 2001).

116 Edwin Mansfield, *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer* (International Finance Corp., World Bank, Discussion Paper No. 19, 1994), *available at* http://ifcln1.ifc.org/ifcext/economics.nsf/AttachmentsByTitle/dp19/$FILE/dp19.pdf.

in multiple countries. In the OECD area in 1995 for example, there were 32,000 families of patents, each protecting a single innovation filed at the European Patent Office, the U.S. Patent and Trademark Office, and the Japanese Patent Office.[117] A number of international treaties and TRIPS extend some similar protections to international technology transfers, including copyrights, trademarks, geographical indications, industrial designs, patents, layout designs of integrated circuits, and undisclosed information.[118] Second, many types of intellectual property are excludable by their owners because certain types of technology are difficult to observe and very costly to imitate. Third, in some industries, owners of intellectual property can protect transfers through license agreements, contractual provisions, and the use of FDI to keep international technology transfers within the company. Increases in FDI over time may indicate greater international trade in technology, either as a means of obtaining or receiving internal transfers of inventions, or as a mechanism for technology diffusion in host countries.

Erosion of international IP rights will reduce the benefits of international trade in technology. This will have the effect of discouraging international trade in goods that embody technology and in disembodied technology. Companies will be reluctant to export goods that embody technological advances to those countries that might require compulsory licensing of technology. Companies already are reluctant to license their technology in countries with weak IP protections. Countries that apply competition policy to remove international IP protections offer a business environment that is comparable to countries that fail to provide IP protections. The uncertainty created by competition policy that threatens to remove IP protections creates additional problems for international businesses. Competition policy that weakens IP rights eliminates the benefits of global competition among innovators. The costs of such competition policy are less international technological diffusion and reductions in the quality of innovation.

B. *How* Microsoft v. Commission *Impacts Gains From Trade and Innovation*

The European Commission (formerly the Commission of the European Communities) is the executive branch of the European Union (EU). The

117 OECD, SCIENCE, TECHNOLOGY AND INDUSTRY SCOREBOARD 2001, at 13.

118 International treaties include the Paris Convention for the Protection of Industrial Property, March 20, 1883, 21 U.S.T. 1583; the Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, as amended in 1979, S. Treaty Doc. No. 99-27, 99th Cong., 2d Sess. (1986), 828 U.N.T.S. 221; the International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations, Rome, Italy, Oct. 26, 1961, 496 U.N.T.S. 43; and the Treaty on Intellectual Property in Respect of Integrated Circuits, May 26, 1989, 28 I.L.M. 1477. The TRIPS Agreement is contained in Annex 1C of the Marrakesh Agreement Establishing the World Trade Organization, 33 I.L.M. 81 (1994). *See* TRIPS: Text of the Agreement, World Trade Organization, http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm (last visited Apr. 25, 2008).

Directorate General for Competition is only one of its many departments, which include those that would be found in a national government's executive branch (economic and monetary, affairs, education, health, consumer protection, energy, trade, and so forth). Since the EU is an alliance of countries, its competition policy is governed by international treaties. The EU's competition policy is based on two provisions of the European Community (EC) treaty. Article 81 covers agreements between two or more firms which restrict competition such as cartels and price fixing.[119] Article 82, which states that firms may not abuse a dominant position, is sufficiently general that practically any action may be taken against firms with a significant market share.[120]

Market share should not be viewed as anticompetitive in itself. The size and scope of global markets often call for large companies that have the resources to serve many diverse types of customers. The international business must also serve corporate customers that operate around the world, including those operating in the EU. Since many of the large firms operating in Europe are foreign multinationals, competition policy under Article 82 can be readily applied to practically any of these companies. European firms with a dominant market position may be shielded from competition policy under Article 82 through their political influence or due to partial or complete ownership by European governments. The European Commission and the EU courts take such political influence into account. For example, in evaluating abuse of a dominant position in *Microsoft v. Commission*, the Court cited the EU legislature's concern with interoperability in the software industry.[121]

The EU's policies are aimed at promoting economic, political, and social cooperation among member countries. Unlike a country such as the United States, the EU lacks a formal constitution, being governed based on treaties among sovereign states. [122] The Commission shares enforcement powers with member countries' court systems and with their competition-policy authorities. The Commission's decisions are subject to review by the European Court of Justice (ECJ) and the Court of First Instance. The effectiveness of appeals of

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119 *See* EC Treaty, *supra* note 13, at art. 81.

120 *Id.* at art. 82.

121 *Microsoft*, 2007 E.C.R. at II-59 - 60.

122 The EU lacks a constitution at this writing, having failed to ratify a proposed constitution. On December 13, 2007, the 27 EU member states agreed to the Treaty of Lisbon, 2007 O.J. (C306) 1, although the treaty requires ratification by the states to come into effect. The treaty supplements earlier agreements, including the Treaty Establishing the European Coal and Steel Community (1951) (often referred to as the E.C.S.C. Treaty or the Treaty of Paris), 261 U.N.T.S. 140,, Treaty Establishing the European Economic Community (1957) (often referred to as the Treaty of Rome or the E.E.C. Treaty), 298 U.N.T.S. 11, Treaty on European Union (1992) (often referred to as Maastricht Agreement) (consolidated version), 2006 O.J. (C 321) E/5. Amending treaties are the Treaty Establishing a Single Council and a Single Commission of the European Communities (1965) (often referred to as the Merger Treaty), 1965 J.O. (152) 1, Treaty of Amsterdam (1997), 1997 O.J. (C340) 1, and Treaty of Nice (2001), 2001 O.J. (C 80) 1. See Europa, Treaties and law, http://europa.eu/abc/treaties/index_en.htm (last visited Apr. 25, 2008). The year refers to the date the treaty was established, not the date it became effective. *Id.*

Commission decisions depends on the degree of independence of the EU courts from the EU's executive and legislative branches. The ECJ differs from national courts in several ways: appointments are political with each member country appointing one judge; only member states can automatically bring a case while "non-privileged" applicants face restrictions; and the Court only considers matters relating to the scope of the EU.[123]

In *Microsoft v. Commission*, the Court of First Instance exhibited remarkable deference to the European Commission's report. Based on a careful review of the highly detailed 248-page decision, I conclude that the Court supported every assertion and opinion of the Commission and rejected every assertion and opinion offered by Microsoft. The decision seemed likely to raise questions about the independence of the EU judiciary. Microsoft agreed to comply with the European Commission's 2004 ruling in October 2007. Microsoft's decision not to appeal further to the ECJ was understandable in light of the limits that EU treaties place on review by the ECJ.

The Commission's decision forced Microsoft to license the communications protocols from its servers, thereby infringing on its IP rights and violating the TRIPS Agreement. The Commission's decision also forced Microsoft to license a degraded version of Windows without Media Player, thereby infringing on its trademark rights and copyright, thus violating the TRIPS Agreement. The Court asserted the primacy of EU law, particularly Article 82, over WTO agreements. The Court further asserted that the WTO agreement provided for competition policy that reduced IP rights.[124] Competition policy as established by *Microsoft v. Commission* represents a fundamental weakness in international IP protection.

Microsoft's compliance involved important IP concessions. Microsoft would make available Windows Server Software interoperability information to open source software developers, charging a one-time fee of €10,000, and minimal royalties to developers such as Sun and IBM for a worldwide license including patents.[125] Microsoft announced an additional set of strategic changes to enhance the interoperability of its products. The company's moves responded in part to market incentives for interoperability. The company's actions also sought to comply with EU competition policy while preempting future regulation. According to Microsoft, "The interoperability principles and actions announced today reflect the changed legal landscape for Microsoft and the IT industry. They are an important step forward for the company in its ongoing efforts to fulfill the responsibilities and obligations outlined in the

123 *See* George Tridimas, *A Political Economy Perspective of Judicial Review in the European Union: Judicial Appointments Rule, Accessibility and Jurisdiction of the European Court of Justice*, 18 EUROPEAN J.L. & ECON. 99 (2004).

124 *Microsoft*, 2007 E.C.R. at II-145, II-213.

125 Lawsky, *supra* note 9.

September 2007 judgment of the European Court of First Instance (CFI)."[126] The interoperability disclosures applied to Windows Vista (including the .Net Framework), Windows Server 2008, SQL Server 2008, Office 2007, Exchange Server 2007, and Office SharePoint Server 2007, and future versions of all these products. In addition to industry outreach and an interoperability initiative, the company announced three key steps. First, it would publish on its website documentation for all application programming interfaces (APIs) and communications protocols in these products, making them available without charge and with immunity from legal challenges to open source developers from Microsoft. Second, Microsoft would document on its website how it would comply with industry interoperability standards and make the documents accessible without a license, royalty, or other fee. Third, Microsoft would "design new APIs for the Word, Excel and PowerPoint applications in Office 2007 to enable developers to plug in additional document formats and to enable users to set these formats as their default for saving documents."[127] These actions illustrate the far-reaching impact of *Microsoft v. Commission*.

IV. The Effects of Competition on the Incentive to Innovate

The Court's decision and that of the Commission in *Microsoft v. Commission* are notable for their focus on market outcomes rather than anticompetitive conduct. In contrast to U.S. antitrust law, EU competition policy views a dominant position as a cause for concern in itself. Instead of examining anticompetitive conduct such as monopolization, the EU considers market structure. This fails to take into account that a firm may achieve a dominant position through cost efficiency, superior products, customer service, and innovation. When firms are penalized for their success, they may seek to avoid actions that will improve their competitive position and draw the attention of regulators. The result will be to discourage innovation.

The definition of anticompetitive conduct does not refer to monopolization but rather to a dominant position that already has been attained. The concept of "abuse of a dominant position" creates a double standard of conduct, one for dominant firms and one for non-dominant firms. What is construed as anticompetitive for a dominant firm may be construed as benignly competitive for a non-dominant firm. This places different responsibilities on firms based on their relative market shares. *Microsoft v. Commission* is a troubling precedent since it finds that a dominant firm has a "special responsibility" to provide its IP to competitors. The case risks discouraging innovation by reducing the returns to investment in R&D.

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126 Press Release, Microsoft, Microsoft Makes Strategic Changes in Technology and Business Practices to Expand Interoperability (Feb. 21, 2008), http://www.microsoft.com/presspass/press/2008/feb08/02-21ExpandInteroperabilityPR.mspx.

127 *Id.*

Competition policy that focuses on market shares rather than conduct has the objective of promoting particular market outcomes rather than vigorous competition. The policy seeks equality of market shares by handicapping winners. Regarding the Court's ruling in *Microsoft v. Commission*, European Commissioner Neelie Kroes stated that "A market level of much less than 95 percent would be a way of measuring success."[128] Kroes further observed that "You can't draw a line and say exactly 50 [percent] is correct, but a significant drop in market share is what we would like to see."[129]

The effect of competition on the incentive to innovate is a critical issue in *Microsoft v. Commission*. At issue is whether competitive markets or monopolized markets are more innovative. The Commission argued that competition stimulates innovation while market power reduces innovation. Commissioner Kroes stated that "monopolists exploiting their strategic position to conquer new markets are less likely to innovate than companies forced to compete for customers on the basis of the merits of their products."[130]

The Commission viewed competition policy aimed at reducing market power as a means of stimulating innovation, even at the cost of reducing IP rights. An overview of the economic analysis of incentives to innovate is useful for placing the discussion in context.[131] This Section presents an economic analysis that demonstrates that competition between adopters of inventions is more important for the incentive to innovate. Competition policy that seeks to eliminate the market power of inventors may decrease the incentive to innovate. The discussion further shows that competition policy that targets market outcomes, as occurred in *Microsoft v. Commission*, is likely to reduce the incentive to innovate.

A. *An Economic Model of Competition and Innovation*

Innovation refers to the commercialization of invention. The incentive to innovate often requires both incentives to invent through R&D and incentives to bring the invention to the marketplace. The effects of competition on innovation depend on both the supply of inventions and the demand for inventions.

128 *EU seeks big drop in Microsoft market share*, REUTERS, Sept. 17, 2007, *available at* http://www.reuters.com/article/marketsNews/idUKL17200587200709 17?rpc=44.

129 *Id.*

130 Neelie Kroes, European Commissioner for Competition Policy, Speech: Antitrust in the EU and in the US—Our common objectives, (Sept. 26, 2007), *available at* http://ec.europa.eu/commission_barroso/kroes/antitrust_eu_us.pdf.

131 The discussion in this section assumes complete information. It draws upon a more general analysis with incomplete information given in Daniel F. Spulber, *Incentives to Invent with Competition and Asymmetric Information* (Nw. Univ. Working Paper, 2008). For competition with asymmetric information about costs, *see also* Daniel F. Spulber, *Bertrand Competition When Rivals' Costs are Unknown*, 43 J. INDUS. ECON. 1 (1995).

Competition thus affects innovation in two ways. On the supply side of the market for inventions, inventors compete to create inventions and to provide them to potential adopters. On the demand side of the market, potential adopters compete to obtain inventions and to provide their customers with products that are based on the inventions. A comprehensive analysis of the effects of competition on innovation should consider competition on the supply side and on the demand side of the market for invention.

Competition among suppliers of inventions is an important phenomenon. Even if inventions are scientifically unique, difficult to copy, or protected by patent, there are alternative inventions that are substitutes in demand. As Edmund Kitch cogently observed, "patents that confer monopoly market power are rare."[132] Kitch discusses "elementary and persistent errors in the economic analysis of intellectual property" noting particularly the incorrect assertion that exclusivity in intellectual property confers an economic monopoly. Even when IP rights confer exclusive ownership to inventors, competition among substitute inventions is feasible. Such competition reduces or eliminates the market power of specific inventions. In the same way, copyrighted works compete with each other.[133] Having a copyright on a unique work such as a novel or a play confers some market power, but that work competes with other literature. The Justice Department recognizes the possibility of competition among owners of IP. The Antitrust Guidelines for Licensing of Intellectual Property state that "[t]he Agencies will not presume that a patent, copyright, or trade secret necessarily confers market power upon its owner."[134]

Firms that adopt inventions can employ them to establish new production processes, to implement new business methods, or to provide new products. Changes in production processes are referred to as process innovations and changes in final products are referred to as product innovations. Firms' demand for inventions depends on the returns they receive to commercializing the invention, that is, their demand for inventions depends on the returns to innovation.

Inventions that are very different can be demand substitutes for the firms that adopt the inventions. For instance, inventions with different scientific and engineering details and patent protections can offer comparable cost savings. These inventions yield process innovations that are substitutes in demand within such categories as machine tools, industrial robots, enterprise software, factory designs, lasers, or chemical processes. Different inventions can be used to develop new products with competing features. These inventions yield

132 Edmund W. Kitch, *Elementary and Persistent Errors in the Economic Analysis of Intellectual Property*, 53 VAND L. REV. 1727, 1730 (2000).

133 *See* Paul Goldstein, *Copyright*, 55 L. & CONTEMP. PROBS. 79, 79-82 (1992); Christopher S. Yoo, *Copyright and Product Differentiation*, 79 N.Y.U. L. REV. 212 (2004).

134 U.S. Dep't of Justice & Fed. Trade Commission, Antitrust Guidelines for the Licensing of Intellectual Property §§ 2.0, 2.2 (1995), *reprinted in* 4 Trade Reg. Rep. (CCH) ¶ 13,132, at 20,734-35.

product innovations that are substitutes in demand within such categories as appliances, electronic gadgets, automobiles, cameras, fabrics, or medicines.

Government officials charged with regulation and competition policy must be careful in distinguishing the effects of policies on the demand side from those on the supply side of the market for inventions. It is necessary to consider both the industrial organization of the invention industry and industrial organization of industries that employ inventions in production and product design.[135]

Classifying the supply side and the demand side of the market for inventions as monopolistic or competitive generates four possible market categories. More distinctions based on the extent of competition on either side of the market would generate more categories. However, the basic classification is sufficient to illustrate the main points of the discussion. Let V represent the returns obtained by an inventor in the market for inventions, without considering the costs of invention. Table 1 lists the incentives to invent for the four market categories.

135 Schumpeter emphasized that firms with market power tend to innovate more. *See* Joseph A. Schumpeter, CAPITALISM, SOCIALISM, AND DEMOCRACY (1975). The effects of market structure on R&D that are discussed here are useful for analyzing the effects of regulatory policy. Generally, market structure and R&D investment are determined jointly in a market equilibrium. *See, e.g.*, Partha Dasgupta, *Patents, Priority and Imitation or, the Economics of Races and Waiting Games*, 98 ECON. J. 66 (1988); Partha Dasgupta & Joseph E. Stiglitz, *Industrial Structure and the Nature of Innovative Activity*, 90 ECON. J. 266 (1986); Almarin Phillips, *Patents, Potential Competition and Technical Progress*, 56 AM. ECON. REV. 301 (1966); Pankaj Tandon, *Innovation, Market Structure, and Welfare*, 74 AM. ECON. REV. 394 (1984). Using a model based on Dasgupta and Stiglitz, Tandon finds that market concentration improves economic efficiency. In Tandon, as in related models, each firm chooses both output and its own cost-reducing R&D so that the demand for and supply of innovations are not separated as in the present analysis.

Supply Side	Demand Side	
	Monopoly Product Market	Competitive Product Market
Monopoly Inventor	V^{MM}	V^{MC}
Competing Inventors	V^{CM}	V^{CC}

Table 1.
The incentive to invent with different market structures on the demand side and on the supply side of the invention market

The discussion in this Section considers both the supply side and the demand side of the invention market. On the supply side, I examine competition between inventors selling different inventions. I compare competing inventors with a monopolist inventor that operates multiple research and development projects and chooses the best invention. On the demand side, I examine how the incentive to invent is affected depending on whether the product market is monopolistic or competitive. A monopoly inventor selling to a monopoly product market is equivalent to a monopoly that is vertically integrated and invents for its own use, as Kenneth Arrow originally assumed in his celebrated discussion of invention.[136]

Arrow's discussion considers the *demand-side* effects of competition in the invention market.[137] Arrow does not examine supply-side effects because he assumes that the inventor is a monopolist. A competitive final product market creates more demand for invention than does a monopolistic final product market. Because a competitive product market is more efficient than a monopolistic one, it generates greater rents for the inventor.

Because Arrow's inventor is a monopolist, the inventor can choose a royalty to extract monopoly rents for his invention. The inventor is able to appropriate the private information that the invention represents. Arrow shows that the inventor's profit is greater in the competitive situation than in the monopoly situation. Arrow's result is that a competitive product market provides a greater incentive to invent than a monopolistic product market.

Arrow's invention is a cost reduction, although he points out that the analysis of a new product should be similar. Following Arrow, let c_0 represent

136 Arrow, *supra* note 106.

137 *Id. See also* Kenneth J. Arrow, *Classificatory Notes on the Production and Transmission of Technological Knowledge*, 59 AM. ECON. REV. 29 (1969).

unit cost *before* the invention. The invention lowers unit cost so that c is the unit cost *after* the invention, where $c < c_0$.

Market demand for the final good in the product market is $D(p)$, where p is the product price.[138] The total profit of all producers in the product market, excluding any costs associated with invention or royalties equals

(1) $\pi(p, c) = (p - c)D(p)$

Consider first Arrow's competitive situation in which a monopoly inventor sells the invention to all producers in a competitive product market. The inventor sets a per-unit royalty equal to r. Since the product market is competitive, the initial price before the invention is introduced equals unit cost, $p_0 = c_0$. What royalty will the inventor choose?

Since the inventor is selling the invention to a competitive market, the post-royalty price is the unit cost plus the royalty:

(2) $p = c + r$

The competitive producers will adopt the invention if and only if the royalty plus the new unit cost does not exceed the unit cost under the old technology:

(3) $c + r \leq c_0$

The inventor's profit is equal to the royalty times the sales of the competitive industry:

(4) $\Pi = rD(c + r)$

The inventor chooses the royalty to maximize profit subject to the maximum royalty constraint.

Arrow identifies two important possibilities. First, if the cost reduction is *drastic*, then the royalty constraint is nonbinding because the cost reduction is large. The invention is said to be drastic if the profit-maximizing price under the new technology does not exceed the unit cost under the old technology, $p^m(c) \leq c_0$. With a drastic invention, the unconstrained royalty maximizes the inventor's profit. This is equivalent to choosing a final product price that maximizes the downstream industry profit. Thus, the unconstrained royalty is simply the downstream monopoly price minus the unit cost under the new technology:

(5) $r^m(c) = p^m(c) - c$

The monopoly inventor selling to the competitive product market extracts all of the profit that would be obtained if the final product industry were a monopoly.[139]

Second, the invention is *nondrastic* if the monopoly price under the new technology is greater than the unit cost under the old technology, $p^m(c) > c_0$. Then, the monopoly inventor will set the highest possible royalty subject to the

138 Assume that demand is a twice continuously differentiable and decreasing function of the product price p. Suppose that profit is concave in price. The profit-maximizing price, $p^m(c)$, is unique and increasing in cost c.

139 With a drastic invention, the inventor's incentive to invent equals $V^{MC}(c) = \pi(p^m(c), c) = (p^m(c) - c)D(p^m(c))$.

now-binding royalty constraint. The royalty will equal the cost reduction from the invention:

(6) $r^m(c) = c_0 - c$

With a nondrastic invention, the monopoly inventor selling to the competitive product market obtains the downstream industry's cost savings.[140]

Consider next the situation in which the monopoly inventor sells the invention to a downstream firm that has a monopoly in the product market.[141] Let R be the monopoly inventor's lump-sum royalty. Then, the downstream monopolist purchases the invention that reduces the unit cost to c if and only if the increase in profit for the downstream firm that employs the new technology is greater than or equal to the royalty.[142]

The monopoly inventor able to make a first-and-final offer will raise the lump-sum royalty to equal the downstream monopolist's willingness to pay. Therefore, the monopoly inventor's incentive to invent when selling the invention to a monopoly product market is just equal to the downstream firm's increase in profit due to the reduction in unit cost.

Comparing incentives to invent when the downstream market is competitive with incentives when it is monopolistic gives Arrow's result.[143]

Proposition 1 (Arrow): The incentive to invent for a monopoly inventor is greater when selling the invention to a competitive product market than when selling the invention to a monopolistic product market, $V^{MC} > V^{MM}$

This proposition highlights the importance of the customer market in providing incentives to innovation. In *Microsoft v. Commission*, the demand side of the relevant markets was highly competitive. The demand side in server software refers to the many companies that buy servers and the necessary

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140 With a nondrastic invention, the inventor's profit will equal $V^{MC}(c) = r^m(c)D(c + r^m(c)) = (c_0 - c)D(c_0)$.

141 Arrow describes this case as that of a vertically-integrated monopoly in which a monopoly inventor also has a monopoly in the product market and uses the invention there himself. For the monopoly inventor selling to a downstream monopoly to correspond to Arrow's vertically integrated monopoly, several conditions must hold. The monopoly inventor must be able to commit to a first-and-final offer of the invention and royalty. In addition, the monopoly inventor must use a lump-sum royalty rather than a royalty per-unit of final output. The inventor cannot offer a per-unit royalty because doing so would create price distortions just as in the standard problem of double-marginalization.

142 The downstream monopolist's initial profit using the old technology equals $\pi(p^m(c_0), c_0) = (p^m(c_0) - c_0)D(p^m(c_0))$. The change in profit for the downstream monopolist must be greater than or equal to the royalty, $\Delta\pi^m(c, c_0) = \pi(p^m(c), c) - \pi(p^m(c_0), c_0) \geq R$. Therefore, the incentive to invent is the maximum royalty which equals the downstream firm's cost reduction, $V^{MM}(c) = R = \Delta\pi^m(c, c_0)$.

143 If the invention is drastic, that is $p^m(c) \leq c_0$, then the monopoly inventor's incentive to invent when selling the invention to a downstream monopoly is less than when selling the invention to a downstream competitive industry. This is because the incentive in the monopoly case, $\Delta\pi^m(c, c_0)$, subtracts the foregone profit under the old technology while the incentive in the competitive case, $\pi(p^m(c), c)$, does not. If the invention is nondrastic, the inventor's incentive in the monopoly case is still $\Delta\pi^m(c, c_0)$, which is lower than the competitive case since $\Delta\pi^m(c, c_0) = \int_c^{c_0} D(p^m(x))dx < (c_0 - c)D(c_0)$
The argument is as follows. Since $p^m(c)$ is increasing in c, it follows that $p^m(x) > p^m(c)$ for all $x > c$. Because the invention is nondrastic, it follows that $p^m(c) > c_0$. Since demand is downward sloping demand, $D(p^m(x)) < D(c_0)$ for all $x > c$. This establishes Arrow's result.

operating system software. The demand side of PC operating systems includes the many consumers of PCs and the necessary operating system software. Consumers also represented the demand for media players.

How will competing inventors affect Arrow's result? Suppose that there are n competing inventors with different inventions represented by unit costs c_i, $i = 1, \ldots, n$. For convenience of discussion, let these inventions be ordered by increasing cost, $c_1 < c_2 < \ldots < c_n$. The inventors are substitutes for each other and for the initial technology because only one technology can be employed in production. All inventions are improvements on the old technology $c_i < c_0$ for all i. Designate the least-cost invention, c_1, as the best invention and c_2 as the second-best invention.

Consider first the situation in which the downstream product market is competitive. Competing inventors choose a per-unit royalty as in the full information setting. The inventors engage in Bertrand price competition in setting their royalty rates. As before, the final price in the downstream competitive product market equals unit production cost plus the per-unit royalty, $p = r + c$. The choice of royalty rates is equivalent to choosing the final product price in the competitive market. The inventor with the best invention offers a royalty that is constrained by the second-best invention, $r \leq c_2 - c_1$.

If the cost difference between the best invention c_1 and the next-best invention c_2 is sufficiently large, that is, $p^m(c_1) \leq c_2$, then competition has little or no effect. The best inventor chooses the final product price $p^*(c_1) = p^m(c_1)$. The inventor with the best invention obtains monopoly returns for his invention and the market price for the final product equals the monopoly price. Thus, when competitive differences are large, the total incentive to invent for competing inventors selling to a downstream competitive market equals the monopoly profit for the downstream industry evaluated at the unit cost of the best technology.

(7) $V^{CC}(c_1, c_2) = \pi(p^m(c_1), c_1)$

This situation can be characterized as a drastic difference between the best and the second-best technology.

Suppose in contrast that the difference in cost between the best invention and the next-best invention is small. The difference in technologies is small if the monopoly price for the downstream industry evaluated at the unit cost of best technology is greater than the unit cost of the second-best technology, that is, if $p^m(c_1) > c_2$. Then, the winning inventor chooses a price equal to the unit cost offered by the second-best invention $p^*(c_1) = c_2$ and earns profit

(8) $V^{CC}(c_1, c_2) = (c_2 - c_1)D(c_2)$

This situation can be characterized as a nondrastic difference between the best and the second-best technology. This is illustrated in Figure 1.

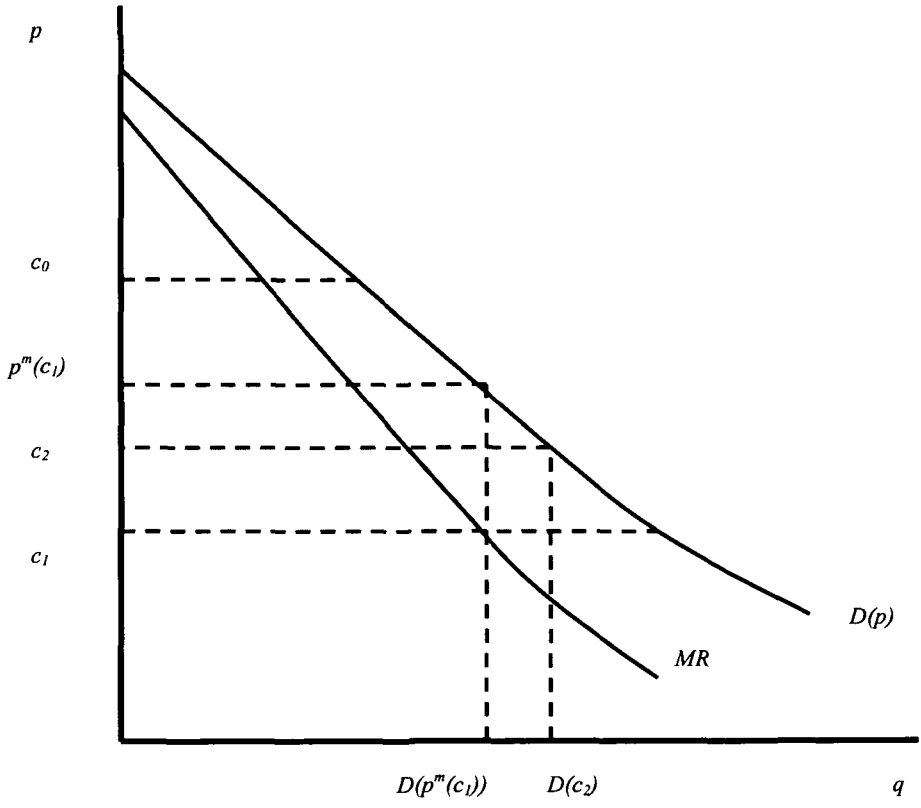

Figure 1.
Profit of the least-cost inventor when there are small technology differences between the best and second-best invention.

Figure 1 shows the profit of the least cost inventor with competition and full information when there is a nondrastic technology difference between the best and second-best invention. This outcome corresponds to a market in which regulators mandate technology licensing and disclosure. Compulsory licensing and disclosure reduce the difference between the technology of the inventor and the technology of competing firms even if the underlying invention is drastic. Narrowing the difference between the best and second-best invention reduces the incentive to invent.

Consider competition among inventors when the difference between the best and second-best invention is nondrastic. As c_2 approaches c_1, the profit of the inventor with the best invention approaches zero. Combining the two possibilities, the final product price offered by the inventor with the best invention is the minimum of the monopoly price for a firm using the best technology and the unit cost of a firm using the second-best technology.[144]

Consider next the situation in which competing inventors try to sell their invention to a product monopoly downstream. The inventors offer their inventions at the lump-sum royalty rates of R_i, $i = 1, \ldots, n$. The monopoly chooses the best invention if and only if the profit from adopting the best technology net of the corresponding royalty is greater than the profit from adopting the second-best technology net of the corresponding royalty. Inventors compete by choosing royalties. The maximum royalty that the inventor with the best invention can obtain with competition equals the difference in profit for the downstream firm using the best versus the second-best technology.[145]

This implies that the incentive to invent for competing inventors selling to a monopolistic product market is the profit difference between the best and the second-best technology. The incentive to invent for competing inventors selling to a monopolistic product market can be written as

(9) $V^{CM}(c_1, c_2) = \Delta\pi^m(c_1, c_2)$

Now, it is possible to compare the situation in which competing inventors offer their inventions to a downstream competitive product industry with that in which competing inventors offer their inventions to a downstream product monopoly.[146]

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144 This is represented as $p^*(c_1) = min\ \{p^m(c_1), c_2\}$, and that inventor's profit is $V^{CC}(c_1, c_2) = \pi(p^*(c_1), c_1)$. The royalty resulting from competition is $r^*(c_1) = p^*(c_1) - c_1$. As long as there is competition between inventors, $p^*(c_1)$ always is less than the cost under the old technology. Thus, all inventions can be viewed as drastic, that is, the maximum royalty constraint due to the initial technology is nonbinding. The initial technology has no effect on the outcome since the inventor's return depends only on the technology of the next-best invention. Since all discoveries lower final cost, the final product price is strictly less than initial cost as a result of competition, $p^*(c_1) < c_0$.

145 Because the downstream firm chooses the best technology if and only if $\pi(p^m(c_1), c_1) - R_1 \geq \pi(p^m(c_2), c_2)) - R_2$, it follows that the competitive royalty offered by the best inventor equals $R_1 = \pi(p^m(c_1), c_1) - \pi(p^m(c_2), c_2) = \Delta\pi^m(c_1, c_2)$.

146 The proposition holds as follows. If competitive differences are large, $p^m(c_1) \leq c_2$, the total incentive to invent with downstream competition, $\pi(p^m(c_1), c_1)$, is greater than it is with a downstream

Proposition 2: Competing inventors selling to a downstream competitive product market have a greater total incentive to invent than when selling the inventions to a downstream monopolistic product market, $V^{CC}(c_1, c_2) > V^{CM}(c_1, c_2)$.

Arrow's demand-side effects still hold when inventors compete. With competing inventions, the total incentive to invent is greater with downstream competition than with downstream monopoly because the second-best invention takes the place of the old technology as a standard of comparison for the new technology. When inventors compete, the problem with monopoly is not inertia associated with the old technology, as commonly believed. Rather, Proposition 2 shows that the reduced incentive to invent under monopoly is due to the profitability to the downstream monopoly of any alternative technology, even the second-best invention.

This proposition further highlights the importance of the customer market in providing incentives to innovation. As already noted, in *Microsoft v. Commission*, the demand sides of the relevant markets were highly competitive. The benefits of downstream competition in generating returns to invention apply with upstream competition among inventors.

We now examine the effects of competition among inventors on the incentive to invent in comparison with a monopoly inventor. To make a proper comparison with competing inventors, the monopoly inventor can run multiple R&D projects. The monopoly inventor has n projects that produce inventions c_i, $i = 1, \ldots, n$. The monopolist will use only the best invention, c_1. Firms sometimes pursue parallel R&D projects. Multiple projects can increase the quality of the best invention.[147]

Consider the situation in which competing inventors offer their inventions to a downstream competitive product market. Recall that if competitive differences between inventions are large, $p^m(c_1) \leq c_2$, the best inventor has the same incentive to invent as a monopoly inventor with invention c_1 that is selling to a downstream competitive product market. Therefore, when the downstream product market is competitive, the total incentive to invent with competing inventors is the same as for the monopoly inventor,

$$V^{CC}(c_1, c_2) = V^{MC}(c_1, c_2) = \pi(p^m(c_1), c_1).$$

This implies the following result.[148]

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monopoly, $\Delta\pi^m(c_1, c_2)$. If competitive differences are small, $p^m(c_1) > c_2$, the total incentive to invent with downstream competition, $(c_2 - c_1)D(c_2)$, is greater than it is with a downstream monopoly, $\Delta\pi^m(c_1, c_2)$.

147 *See* Nelson, *supra* note 1088.

148 If competitive differences between inventions are small, $p^m(c_1) > c_2$, recall that the best inventor's incentive to invent is $(c_2 - c_1)D(c_2)$. If the best invention is drastic in Arrow's sense, $p^m(c_1) \leq c_0$, recall that the monopolist's incentive to invent when selling to a competitive product market equals the profit of a downstream monopolist. The monopolist's incentive to invent is greater than it is for competing inventors since $(p^m(c_1) - c_1)D(p^m(c_1)) > (c_2 - c_1)D(c_2)$. This follows from the definition of profit maximization and $p^m(c_1) > c_2$. If the best invention is nondrastic in Arrow's sense, $p^m(c_1) > c_0$, recall that the monopolist's incentive to invent when selling to a competitive market equals $(c_0 - c_1)D(c_0)$, which is greater than it is for competing inventors selling to a competitive market, $(c_2 -$

Proposition 3: A monopoly inventor selling to a competitive product market has an incentive to invent that is greater than or equal to the total incentive to invent of competing inventors selling to a competitive product market, $V^{MC}(c_1, c_2) \geq V^{CC}(c_1, c_2)$.

This result challenges the notion in *Microsoft v. Commission* that competition stimulates innovation. Competition among inventors, by dissipating rents, may reduce the incentive to invent relative to a monopoly. An inventor with market power may obtain greater returns to invention, leading it to do additional research and develop new products. Competition policy aimed at reducing the market power of inventors may reduce these incentives to invent.

With competing inventors selling to a monopolistic product market, the total incentive to invent is $V^{CM}(c_1, c_2) = \Delta\pi^m(c_1, c_2)$. Compare this situation with a monopoly inventor selling to a monopolistic product market. When selling to a downstream monopoly, the monopoly inventor's incentive to invent will be the same as that given by Arrow, $V^{MM}(c_1, c_2) = \Delta\pi^m(c_1, c_0)$.

Proposition 4: A monopoly inventor selling to a monopolistic product market has an incentive to invent that is greater than the total incentive to invent of competing inventors selling to a monopolist product market, $V^{MM}(c_1, c_2) > V^{CM}(c_1, c_2)$. Again, competition among inventors dissipates the returns to invention. This can mean that a monopoly inventor has greater incentives to invent even when the downstream market is monopolistic.

Combining these results has an additional implication.[149]

Proposition 5: A monopoly inventor selling to a competitive product market has an incentive to invent that is greater than the total incentive to invent of competing inventors selling to a monopolist product market, $V^{MC}(c_1, c_2) > V^{CM}(c_1, c_2)$. This result follows from two effects that reinforce each other. The combination of upstream monopoly and downstream competition increase the incentive to invent in comparison with the combination of upstream competition and downstream monopoly.

Now compare the monopoly inventor selling to a downstream monopoly product market with competing inventors selling their inventions to competitive producers. With competition among inventors, the inventor with the best invention takes into account the quality of the next best invention. In contrast, the monopoly inventor only compares the best invention with the old technology.[150]

$c_1)D(c_2)$. This follows from profit maximization and $p^m(c_1) > c_0 > c_2$, which implies that a price equal to c_0 generates greater profit than a price equal to than c_2 because c_0 is closer to the monopoly price. This implies that $V^{MC}(c_1, c_2) > V^{CC}(c_1, c_2)$ when competitive differences are small.

149 This result can be obtained in two different ways. First, note that $V^{MC}(c_1, c_2) > V^{MM}(c_1, c_2) > V^{CM}(c_1, c_2)$. Second, note that $V^{MC}(c_1, c_2) > V^{CC}(c_1, c_2) > V^{CM}(c_1, c_2)$.

150 If competitive differences between inventions are large, $p^m(c_1) \leq c_2$, the total incentive to invent under competition, $V^{CC}(c_1, c_2) = \pi(p^m(c_1), c_1)$ is greater than that of the monopoly inventor selling to a downstream monopoly product market. However, if competitive differences between inventions are

Proposition 6: When the costs of the best invention and the second-best invention are similar, the incentive to invent for a monopoly inventor selling to a downstream product monopoly (or equivalently a vertically-integrated monopoly with multiple projects) is greater than the total incentive to invent with competing inventors selling to a downstream competitive product market, $V^{MM}(c_1, c_2) > V^{CC}(c_1, c_2)$. When these costs differ substantially, competing inventors have a greater total incentive to invent than the monopoly inventor selling to a downstream product monopoly.[151]

If the demand-side effect predominates over the supply-side effect, competing inventors selling to a competitive product market have a greater total incentive to invent than the monopolist inventor selling to a monopolistic product market, conforming to Arrow's result. Conversely, if the supply-side effect predominates over the demand-side effect, the monopolist inventor selling to a monopolistic product market has a greater incentive to invent, differing from Arrow's result. When inventions are similar, supply-side effects of competition between inventors overcome the demand-side effects of competition on the incentive to invent.[152]

This result has an important implication for competition policy that targets IP. Competing inventors may obtain inventions that have drastic differences. The potential returns for the successful firm will stimulate inventive activity. However, if competition policy narrows the differences among technologies, the result will be to reduce returns for successful firms and reduce inventive activity. Compulsory disclosure and forced licensing serves to eliminate drastic technology differences among competing inventors. The result will be technologies that are similar. By reducing the rewards to invention, the benefits of competition among inventors are reduced or eliminated. A monopoly inventor will have greater incentives to invent than competing inventors with narrow differences in their technology.

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small, $p^m(c_1) > c_2$, then the monopoly inventor selling to a downstream monopoly product market has greater profits when
$V^{CC}(c_1, c_2) = (c_2 - c_1)D(c_2) < \pi\,(p^m(c_1), c_1) - \pi(p^m(c_0), c_0) = \int_{c_1}^{c_0} D(p^m(x))dx$. For c_2 sufficiently close to c_1, the incentive to invent for competing inventors becomes arbitrarily small. Define a critical value c_2^* as the solution to $(c_2^* - c_1)D(c_2^*) = \int_{c}^{c_0} D(p^m(x))dx$. Thus, for all competing second-best inventions c_2 such that $c_1 \le c_2 \le c_2^*$, the total incentive to invent is lower for the competing inventors selling to a competitive product market than for the monopoly inventor selling to a downstream monopoly product market.

151 For any best invention c_1, there exists a critical value $c_2^* > c_1$ such that for all competing second-best inventions c_2 such that $c_1 \le c_2 < c_2^*$, the incentive to invent for a monopoly inventor selling to a downstream product monopoly (or equivalently a vertically-integrated monopoly with multiple projects) is greater than the total incentive to invent with competing inventors selling to a downstream competitive product market, $V^{MM}(c_1, c_2) > V^{CC}(c_1, c_2)$.

152 When each inventor has private information about the quality of his invention, the supply-side effect predominates over the demand-side effect if and only if the number of inventors is sufficiently large. The reason is that more intense competition between inventors erodes the total incentive to invent in comparison to the monopolist inventor selling to a monopolistic product market, *see* Spulber, *Incentives to Invent with Competition and Asymmetric Information* (Nw. Univ. Sch. of Law Working Paper, 2008).

Competition among inventors dissipates economic rents. Accordingly, more competition on the supply side of the invention market decreases the incentive to invent. In the economics literature, other frameworks show that competition among inventors dissipates economic rents. Competition lowers returns to invention when firms race to develop an invention.[153] Invention tournaments stimulate inventive effort in comparison with individual contracts but competition still lowers the incentive to invent.[154]

Incentives to innovate also affect the number of R&D projects. The inertia of a vertically-integrated monopolist that Arrow identified tends to occur when there is a single R&D project. This is because the potential invention resulting from the single project is compared to the existing technology. However, with multiple projects, the monopoly inventor makes decisions at the margin, choosing the number of parallel projects based on their marginal contribution. Although this helps to overcome the inertia from the existing technology, the monopoly inventor selling to a downstream monopolistic market is still less innovative than a monopoly selling to a competitive downstream product market. This is due to beneficial effects of downstream competition on the expected marginal returns to R&D projects. Also, more competing inventors enter the market for inventions when the downstream product market is competitive than when the downstream market is monopolistic.

Entry of inventors depends on the average returns to invention. The number of projects chosen by a monopolist depends on the marginal returns to invention. The number of competing inventors that enter the market can be greater or less than the number of projects chosen by a monopoly inventor, whether they are selling their inventions to a competitive product market or to a monopolistic product market or if the competing inventors sell to a competitive

153 The literature on racing to invent generally assumes that inventions are identical, with an exclusive monopoly patent going to the firm that wins the race. *See, e.g.*, Partha Dasgupta & Joseph Stiglitz, *Uncertainty, Industrial Structure, and the Speed of R&D*, 11 BELL J. OF ECON. 1 (1980); Richard J. Gilbert & David M. G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982). For a survey of the racing literature, see Jennifer Reinganum, *The Timing of Innovation: Research, Development, and Diffusion*, *in* 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 849 (Richard Schmalensee & Robert Willig eds., 1989). On licensing of inventions, see Michael L. Katz & Carl Shapiro, *R&D Rivalry with Licensing or Imitation*, 77 AM. ECON. REV. 402 (1987); Stephen Salant, Comment, *Preemptive Patenting and the Persistence of Monopoly*, 74 AM. ECON. REV. 247 (1984). Various studies examine oligopoly competition among firms who undertake internal R&D to lower their own costs. *See, e.g.*, Dasgupta & Stiglitz, *supra* note 135; Joshua S. Gans & Scott Stern, *Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction*, 9 J. ECON. & MGMT. STRATEGY 485 (2000).

154 The literature on research tournaments studies the design of incentives for inventive effort. In a tournament, a sponsor designs the prize for the best innovation and contestants devote effort to producing inventions. *See, e.g.*, Yeon-Koo Che & Ian Gale, *Optimal Design of Research Contests*, AM. ECON. REV. 646 (2003); Curtis R. Taylor, *Digging for Golden Carrots: An Analysis of Research Tournaments*, 85 AM. ECON. REV. 872 (1995). Baye and Hoppe show that racing and tournaments are equivalent. *See* Michael R. Baye & Heidrun H. Hoppe, *The Strategic Equivalence of Rent-Seeking, Innovation, and Patent-Race Games*, 44 GAMES & ECON. BEHAV. 217 (2003). In contrast to the racing literature, the analysis in this Section assumes that inventions differ and that inventors compete after making their discoveries. In contrast to the tournaments approach, the analysis in this Section does not examine inventive effort and focuses on the effects of market structure on the incentive to invent.

product market and the monopoly inventor sells to a monopolistic product market. Competitive entry and the choice of multiple R&D projects by firms affect outcomes in the market for inventions.

The analysis of the incentive to invent strongly suggests the need for regulatory forbearance. The incentive to innovate depends on both demand-side and supply-side factors. Greater competition among users of the invention tends to increase the incentive to invent, as Arrow observed. Greater competition among inventors can reduce the incentive to invent by dissipating rents. Policymakers should identify carefully the demand-side and the supply-side effects of competition in markets for innovation.[155] Sorting out these effects is likely to be difficult in practice. Policymakers cannot expect that competition policy will result in increased incentive to innovate.

Although patents offer property rights with some degree of exclusion, inventors still face competition from other inventors that develop substitute inventions. The tradeoff offered by the length of patent lives is well known. Longer patent lives confer property rights that can increase the incentive to invent while longer patent lives might reduce the diffusion of innovations. This tradeoff bears further examination in light of the effects of competing inventors on the incentive to invent. The possibility that a vertically-integrated firm with market power may be highly innovative suggests the need for antitrust forbearance in vertical and horizontal merger policy.

B. Microsoft v. Commission *Addresses Market Outcomes Rather than Competition*

The European Commission argued that by promoting competition, it was also increasing the incentive to innovate. Putting aside the effects of eroding IP rights, does competition necessarily stimulate innovation? The discussion in the previous Section demonstrates that competition among customers of technology generates rents that increase the demand for innovation. However, competition among companies that engage in innovation dissipates rents and can reduce the supply of innovation. Competition among inventors can generate more or less resources devoted to invention in comparison with a monopoly inventor that operates multiple R&D projects. The outcome depends on how the average returns to R&D with competing inventors compare with the marginal returns to invention of a monopoly inventor. Between the extremes of competition and monopoly, having more inventors reduces the rents to invention.

The link between competition and innovation is far more complex than the Commission believes. Competition policy that promotes competition for its

155 Christopher Yoo, *Vertical Integration and Media Regulation in the New Economy*, 19 YALE J. ON REG. 171, 276-78 (2002) (discussing the ambiguity of empirical results, suggesting that this careful analysis should be valuable).

own sake need not result in greater innovation. The economic rents generated by successful products can be dissipated by public policy that promotes competition at all costs. The result will be fewer innovations, resulting in less product variety and higher production costs. Consumers are made worse off by an industry that competes more and innovates less. Consumers will be willing to pay more for a product that offers improved features.

Microsoft already faced substantial competition in the market for server operating systems software. The complaints of competitors such as Sun illustrate that such competition was vigorous before the intervention of the Commission. The efforts of the Commission to heighten price competition by eliminating technology differences merely served to dissipate the rents to innovation. This will lower the returns to improvements in server operating systems. The demand side of the server operating systems market was highly competitive. Many firms purchased this software for their servers. Improvements in server operating systems lowered the production costs for firms that purchased the software.

Competition policy that targets market outcomes rather than anticompetitive conduct reduces the expected rewards for successful firms. Policies that place asymmetric burdens on firms that have larger market shares will reduce the incentive to innovate for both large and small firms. Deterrence of innovation may cause firms to seek other avenues of competition, from high-priced branding strategies to bargain-basement pricing strategies. At risk are the potential benefits of new products, new technologies, and new transaction methods. Consumers are harmed when competition policy diminishes the incentive to innovate.

V. Conclusion

Microsoft v. Commission diminishes the incentive to innovate in several critical ways. By reducing IP protections, *Microsoft v. Commission* reduced the incentive to innovate both for successful firms and for their competitors. The Court extended the essential facilities doctrine to IP to justify reduction of IP protections. In addition, the Court justified unbundled access IP, setting a dangerous precedent that allows policymakers to target specific elements of software, or more generally, specific ideas contained within inventions. Companies will be reluctant to invest in R&D if they face mandatory unbundling and disclosure of their inventions. Competitors will be discouraged from investing in R&D if they can obtain IP from leading firms by the threat of complaints to competition policymakers.

By rejecting international IP protections, *Microsoft v. Commission* reduces the beneficial effects of international trade on the incentive to innovate. The Commission viewed competition policy as working "in tandem" with its EU trade policy. The case signaled an activist competition policy that would target successful companies and seek to limit global competition. The decisions

of the Court and of the European Commission reflect underlying concerns about global competition within the European Union. Rather than relying on the innovative abilities of companies within the EU, competition policymakers chose instead to penalize a company for its market success. Instead of trusting European companies to develop new technology and trusting European consumers to make informed decisions, EU policymakers chose a protectionist industrial policy. The European Commission soon identified Intel and other large international companies as future targets. The question is whether the EU wishes to participate in the global marketplace, or whether it prefers to erect a fortress of regulations that deter foreign competitors.

By focusing on market outcomes rather than competitive conduct, *Microsoft v. Commission* limits the incentive of firms to succeed by innovation. Companies in every industry face an existential dilemma. If the company does not devote resources to innovation, the firm will be at a competitive disadvantage. However, if the company devotes resources to innovation and is successful in the marketplace, it risks antitrust scrutiny. A firm can gain a competitive advantage through successful innovation, at least temporarily. Yet, a dominant position risks legal action from the EU that can result in large fines, compulsory licensing, mandatory disclosure, and unbundling of IP. This will make firms reluctant to invest in research, to commercialize inventions, and to develop new products. The more successful a company has been in the marketplace in the past, the more its future innovations will be scrutinized. The doctrine of "abuse of a dominant position" as interpreted in *Microsoft v. Commission* targets success rather than anticompetitive behavior.

Competition policy that weakens IP rights affects the incentives to innovate for firms in practically any industry. The result is less innovation at the margin and harm to consumer welfare. Competition policy that weakens international IP protections reduces the diffusion of innovation across international borders and diminishes the potential gains from trade associated with international markets for technology. Competition policy that targets successful firms reduces the returns to invention.